Measuring the Agility of Omnichannel Operations: an Agile Marketing Maturity Model

Mike Hoogveld[1], John Koster[2]
[1&2]*Nyenrode Business University, Center for Marketing & Supply Chain Management, Breukelen, the Netherlands*

Abstract

Agile is a widely accepted approach for software development. The deployment of agile in marketing practice is proliferating and appears also relevant for the dynamics and complexity of omnichannel operations. However, prior literature research showed that no well-founded method is available for measuring the agility level of marketing processes. The objective of the systematic literature review presented in this paper is to provide a comprehensive list of agility measurement methods for software development and to identify which ones might also be suitable for adaptation to marketing practice. This resulted in an overview of 52 currently available agility measurement methods that were categorized in three schools of thought: scaling, hierarchical levels, and sub-processes. These methods have shown to be diverse in terms of approach and quality. Five agility measurement methods were further assessed on specific quality criteria. The conclusion is that the OPS framework appears to be the most suitable one for adaptation to marketing practice.

Keywords: *Agile, lean, marketing, maturity, measurement, omnichannel*

I. INTRODUCTION

Currently, the deployment of lean and agile is gaining ground within marketing to create an adaptive operation that incrementally develops its strategy by experimenting [1]. Blank claims that using the 'lean start-up' approach, which combines elements of lean and agile, results in fewer failures than using traditional approaches. Referring to the Agile Marketing Manifesto principles [2], Blank describes these principles as a methodology that 'favours experimentation over elaborate planning, customer feedback over intuition, and iterative design over traditional big-design-upfront development' in focusing on continuous improvement processes to create value more effectively. Increasingly, he sees large companies beginning to implement the lean start-up approach [3].

The most important conclusions from prior research are that despite the fact that the deployment of agile processes is relevant for the dynamics and complexity of omnichannel operations, to date not much has been written about the implementation of agile in marketing practice. Moreover, based on this research a relationship is presumed between the agility level of marketing processes and customer performance. To be able to determine the nature of this relationship, a theoretically sound method is needed for measuring the agility level of marketing processes. To date, such a method is not available [4].

II. RESEARCH GOAL AND METHOD

The goal of this research is to provide a theoretical basis for developing a method to measure the agility level of marketing processes. More specifically, the associated research questions are:

- What academically substantiated methods for measuring agility are currently available?
- Which of these methods are potentially suitable to be deployed in marketing practice?
- Which of these alternatives is best suitable to be deployed in marketing practice?
- What adaptations are possibly required for this purpose?

To answer these research questions a systematic literature review (SLR) has been performed, following the guidelines of Kitchenham [5]. The protocol of this SLR is summarized below.

A. Research Process: Stage 1 and 2

Based on the research questions, an iterative research strategy has been developed, consisting of three stages:

- Stage 1: querying digital libraries and Google to identify all available methods for measuring agility;
- Stage 2: selecting relevant methods by applying inclusion and exclusion criteria;
- Stage 3: determining the most suitable method by assessing the selected methods on specific quality criteria.

In stage 1 the research was focused on articles that are available online and written in English. Initially the information sources comprised multiple digital libraries, as listed below:

- Google Scholar (scholar.google.com)
- IEEEXplore (ieeexplore.ieee.org/xplore)
- Wiley InterSciene (interscience.wiley.com)
- Elsevier Science Direct (sciencedirect.com)
- SpringerLink (springerlink.com)

As these sources generated a limited number of articles and thus methods, a 'snowball' approach was

used to broaden the results. This involved analysis of the literature references in the articles to discover additional methods. As this resulted in a slight increase of results, it was decided to run a complementary Google query.

The digital libraries and Google have been queried using multiple terms. As specified in Table 1, the search terms consisted of three different categories. Within a category the search terms were combined using the Boolean 'OR'. The resulting three lists were subsequently combined using the Boolean 'AND'. The search was restricted to title, keywords and abstract.

Table I : Search Terms used in Stage 1 of the SLR

Descriptor category	Search terms
Agility	Agile; agility; lean; scrum
Maturity	Adoption; implementation; level; maturity; performance; progress; transformation
Method	Analysis; assessment; benchmark; checklist; framework; index; indicator; measurement; model; roadmap; scale; test

For storing the relevant papers, the citation management procedure as reported by Dingsoyr and Dyba [6] has been applied using Mendeley Desktop. The citations were exported to an Excel spreadsheet, logging the sources and inclusion/ exclusion decision for each citation. For each stage separate Mendeley Desktop groups and Excel spreadsheet tabs were maintained.

From each article the following data were extracted and tabulated:

- The source and full reference;
- The name of the agility measurement method;
- Whether the method is academically substantiated;
- Whether the method has been tested in practice;
- Whether the method is presented in full detail.

For assessing the relevance of the 52 methods resulting from the search in stage 1, inclusion and exclusion criteria have been applied in stage 2 to identify those methods that address the research questions. These criteria are specified in Table 2 below.

Table II : Inclusion and Exclusion Criteria used in Stage 2 of the SLR

Goal	Criterion
Inclusion	1. Articles that present a method for measuring agility
Exclusion	2. The method is not academically substantiated
	3. The method cannot be analysed in detail as the article and any additional documentation do not present all constituent parts

The assessment in stage 2 resulted in a subset of methods that were to be further analysed in stage 3.

B. Stage 3: Quality Assessment of the Relevant Methods

In stage 3 the methods have been assessed on quality. For one part the quality aspects focus on validity [5], as specified in table 3. For the other part the quality aspects focus on the suitability of the method for usage in marketing practice. The suitability for marketing practice has been operationalized using Kotler's classical definition of marketing processes [7].

According to Kotler 'marketing is the process by which organizations create value for customers and build strong relationships to capture value from customers.' For an organization to achieve these objectives, Kotler contends that the following five essential sub-processes need to be performed successfully: opportunity identification, new product development, customer attraction, customer retention and loyalty building, and order fulfilment. For these sub-processes to be effective in facilitating an omnichannel customer experience, Kotler has identified the following success factors [8]:

- Jointly involving (or setting up integrated teams comprising) marketing, sales, and customer service in key activities such as assessing customer needs, analysing top opportunities, generating value propositions, setting targets, and coordinating channels;
- Emphasizing shared responsibility for results between the team members and stakeholders;
- Implementing systems and shared databases to track and manage these joint activities;
- Establishing common metrics for evaluating the success of the joint activities;
- Creating reward systems to laud the success of the joint activities;
- Enforcing the conformity of team members and stakeholders to systems and processes;
- Mandating the team members and stakeholders to periodically review and improve the joint activities.

The suitability of the methods for marketing practice is determined by the degree to which they comprise, or can be adapted to comprise, measurement of the success factors above. This criterion and the validity criteria [5] are specified in Table 3.

III. RESULTS

A. Stage 1: Overview of all Available Methods

Stage 1 of the SLR resulted in 52 unduplicated agility measurement methods, as listed

in Table 4. From this overview en the underlying research different conclusions can be drawn. The first conclusion is that the vast majority of the methods, 44 in total, originate from practitioners, an observation that is confirmed by Adali, Öczan-Top and Demirörs [9]. Academically substantiated methods are limited in number, and they prove to be scarcely used in practice [10].

Table III : Quality Assessment Criteria used in Stage 3 of the SLR

Quality aspect	Criterion	Operationalization
Validity	Description of goals	Are the aims of the model clearly stated?
	Relevance of variables	Are the variables used in the model the most relevant ones for answering the underlying research questions?
	Adequacy of measures	Are the variables used in the model adequately measured?
	Definition of measures	Are the measures used in the model fully defined?
	Scoring method	Are scoring systems described?
	Data collection	Are the data collection methods adequately justified?
	Data analysis	Are the statistical methods described?
	Inference	Is the scope for drawing wider inference explained?
	Deployment in ractice	Has the method been empirically tested or is it only conceptually defined?
Suitability	Independence	Does the method have an unbiased, neutral character (e.g. not steering towards a desired outcome such as a commercial purpose)?
	Comprehensiveness	Does the method completely cover all the characteristics of agility in general instead of limiting itself to a specific agile approach (e.g. Scrum, Kanban, XP)?
	Measurement level	Does the method measure agility at the team level or higher?
	Suitability for marketing practice	Do the variables match with (or can they be adapted to) Kotler's success factors for omnichannel marketing processes?

Secondly, the methods vary strongly in their measurement approach and the level of detail and quality they pursue. According to Taromirad and Ramsin [11] the proliferation of agile software development methodologies has raised the need for evaluation. Based on their evaluation they concluded that existing frameworks did not satisfy typical requirements, and failed to address existing challenges. Currently, there still seems to be no commonly accepted model, as was confirmed previously by Schweigert et al. [12] and Jalali et al. [10]. In general, three schools of thought can be distinguished.

The first school of thought considers agile maturity mainly as an issue of scaling. The transformation starts with adoption by a single team and then spreads out to ultimately span the entire organization. Well-known examples of this school of thought are the

LeSS, SAFe and DAD methods [13][14][15]. Based on the literature review no academic evidence has been identified for the relationship between the scaling levels and organizational performance improvement. The second school of thought assesses an organization in its entirety on the hierarchical level of maturity it has reached in different agility aspects. Many attempts have been made to define agile maturity in terms of hierarchical levels [12], mostly by linking it to ISACA's Capability Maturity Model Integration, the CMMI [16]. Based on the literature review no academic evidence has been identified for the relationship between these hierarchical levels and organizational performance improvement.

Finally, the third school of thought maintains that agile maturity is not a generic concept and cannot be assessed in terms of hierarchical levels. It views agile practices strictly as means to an end that have to be tailored to the specific goals and needs of an organization. Therefore, its conviction is that it is necessary to look at each sub-process separately. Based on the literature review no academic evidence has been identified for the relationship between these sub-processes and organizational performance improvement.

B. Stage 2: Selection of Methods and Initial Analysis

Applying the inclusion and exclusion criteria in stage 2, as specified in table 2, resulted in 45 methods being rejected and seven methods being selected. These seven methods are: the Agile Adoption and Improvement Model; the Agile Adoption Framework; the Agility Index; the Agile Maturity Model; the Comprehensive Agility Measurement Tool; the Objectives-Principles-Strategies framework; the Scrum Maturity Model. Based on further analysis these seven methods will be discussed briefly below.

1) Agile Adoption and Improvement Model (AAIM): The AAIM [17] represents the second school of thought, focusing on hierarchical maturity levels. The AAIM consists of six hierarchical levels, called 'agile stages': agile infancy, agile initial, agile realization, agile value, agile smart, and agile

TABLE IV
The Agility Measurement Methods Resulting from Stage 1 of the SLR

	Method	Origin	Approach	Level of detail	Applied in practice?	Source
1	42-points test	Practitioners	Sub processes	Medium	Unknown	http://www.allaboutagile.com/how-agile-are-you-take-this-42-point-test/
2	A better team	Practitioners	Sub processes	Medium	Unknown	http://www.jamesshore.com/Blog/abetterteam.html
3	ADAPT	Practitioners	Sub processes	Medium	Unknown	https://www.mountaingoatsoftware.com/presentations/adapting-to-agile
4	Aditi Agile Transformation Maturity Model	Practitioners	Hierarchical	Medium	Unknown	https://confengine.com/agile-india-2014/proposal/236/agile-transformation-maturity-model
5	Agile Adoption and Improvement Model	Academic	Hierarchical	Medium	No	[17]
6	Agile 3R Model of Maturity Assessment	Practitioners	Sub processes	Low	No	https://www.scrumalliance.org/community/articles/2015/march/agile-3r-model-maturity-assessment
7	Agile Adoption and Transformation Guide	Practitioners	Sub processes	Medium	Unknown	http://www.infoq.com/minibooks/agile-adoption-transformation
8	Agile Adoption Framework	Academic	Hierarchical	High	Yes	[18]
9	Agile Adoption Model	Practitioners	Sub processes	Low	No	https://www.scrumalliance.org/community/articles/2013/july/an-agile-adoption-model
10	Agile Assessment	Practitioners	Sub processes	Medium	Unknown	https://nowinskipiotr.wordpress.com/2016/04/29/agile-assessment/
11	Agility Calculator Tool	Practitioners	Sub processes	Low	Yes	http://info.versionone.com/Agility-Calculator-Tool.html
12	Agile Development Maturity Model	Practitioners	Hierarchical	Low	No	http://vitalflux.com/learnt-agile-development-processes-now-whats-next/
13	Agile Enterprise Survey	Practitioners	Sub processes	Medium	Yes	http://www.storm-consulting.com/agile-enterprise-survey/
14	Agile Fluency Model	Practitioners	Hierarchical	Medium	No	http://www.agilefluency.org/model.php
15	Agile Journey Index	Practitioners	Hierarchical	Medium	Unknown	http://www.agiledimensions.com/blog/agile-journey-index/
16	Agile Maturity Map	Practitioners	Sub processes	Medium	No	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.582.9006&rep=rep1&type=pdf
17	Agile Maturity Model	Academic	Hierarchical	High	No	[19]
18	Agile Maturity Model (AMM)	Practitioners	Scaling	Medium	No	https://danossia.wordpress.com/2010/07/12/yet-another-agile-maturity-model-the-5-levels-of-maturity/
19	Agile Maturity Model (Pettit)	Practitioners	Sub processes	Medium	No	http://www.shaunjayaraj.com/2008/08/agile-maturity-model.html
20	Agile Maturity Patterns	Practitioners	Sub processes	Low	Unknown	http://www.agilealliance.org/wp-content/uploads/files/session_pdfs/Mature Agile Teams - Essential Patterns v4 - Half day Workshop.pdf
21	Agile Maturity Self-Assessment Survey	Practitioners	Sub processes	Low	Yes	https://www.scrumalliance.org/community/articles/2015/december/agile-maturity-self-assessment-survey
22	Agile Questionnaire	Practitioners	Sub processes	Low	Unknown	http://www.thedigitalbusinessanalyst.co.uk/2014/07/Agile-Questionnaire.html
23	Agile Readiness	Practitioners	Hierarchical	Low	No	http://programmedevelopment.com/evaluating-ability/evaluating-organisations/agile-readiness-maturity
24	Agile Self Assessment	Practitioners	Hierarchical	Medium	Unknown	http://www.agileprojectmanagementtraining.com/agile-self-assessment/
25	Agile Scaling Model IBM	Practitioners	Scaling	High	No	https://www.ibm.com/developerworks/community/blogs/ambler/entry/agile_scaling_model?lang=en
26	Agile Team Evaluation	Practitioners	Sub processes	Low	No	https://blogs.msdn.microsoft.com/ericgu/2015/10/05/agile-team-evaluation/
27	Agility Health Dashboard	Practitioners	Sub processes	Low	Unknown	http://illustratedagile.com/2012/09/25/how-to-measure-team-agility/
28	Agility Health Radar	Practitioners	Sub processes	High	Yes	http://agilityhealthradar.com

29	Agility Index	Academic	Sub processes	High	No	[20]
30	Agility Maturity Model	Practitioners	Hierarchical	Low	No	http://info.thoughtworks.com/rs/thoughtworks2/images/agile_maturity_model.pdf
31	Agility Path	Practitioners	Sub processes	Medium	Yes	https://www.scrum.org/Blog/ArtMID/1765/ArticleID/14/%E2%80%98Evidence-Based-Management%E2%80%99-for-Software-Organizations
32	Borland Agile Assessment	Practitioners	Sub processes	Low	Yes	http://borland.typepad.com/agile_transformation/2009/03/borland-agile-assessment-2009.html
33	Comparative Agility Assessment	Practitioners	Sub processes	High	Yes	http://comparativeagility.com/
34	Comprehensive Agility Measurement Tool	Academic	Sub processes	Medium	Yes	[21]
35	Corporate Agile 10-point checklist	Practitioners	Sub processes	Low	No	http://pagilista.blogspot.nl/2012/12/a-corporate-agile-10-point-checklist.html
36	Disciplined Agile Delivery framework (DAD)	Practitioners	Scaling	High	Yes	https://disciplinedagileconsortium.org/resources/Documents/TheDAFramework.pdf
37	Depth of Kanban	Practitioners	Sub processes	High	Yes	http://leanagileprojects.blogspot.nl/2013/03/depth-of-kanban-good-coaching-tool.html
38	Enterprise Agility Maturity Matrix	Practitioners	Sub processes	Medium	Unknown	http://blogs.atlassian.com/2013/11/enterprise-agility-maturity-matrix/
39	Enterprise Agility Roadmap	Practitioners	Scaling	Medium	Unknown	http://www.netobjectives.com/enterprise-agility-roadmap-essentials
40	IBM DevOps Practices Self Assessment	Practitioners	Sub processes	High	Yes	http://www.surveygizmo.com/s3/1659087/IBM-DevOps-Self-Assessment
41	KPMG Agile Assessment	Practitioners	Hierarchical	Medium	Yes	http://www.compact.nl/artikelen/C-2014-3-Brummelen2.htm
42	Large Scale Scrum Framework (LeSS)	Practitioners	Scaling	High	Yes	http://less.works
43	Lean Enterprise Self Assessment Tool	Academic	Hierarchical	High	Yes	http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-852j-integrating-the-lean-enterprise-fall-2005/lecture-notes/13_lesat.pdf
44	Maturity Assessment Model for Scrum Teams	Practitioners	Sub processes	Low	Unknown	https://www.scrumalliance.org/community/articles/2014/july/maturity-assessment-model-for-the-scrum-teams
45	Objectives-Principles-Strategies framework	Academic	Sub processes	High	Yes	[22]
46	Roadmap for Agile Success	Practitioners	Sub processes	Medium	No	http://www.emergn.com/insights/roadmap-for-agile-success/
47	Scaled Agile Framework	Practitioners	Scaling	High	Yes	http://scaledagileframework.com
48	Scrum Butt Test (Nokia Test)	Practitioners	Sub processes	Low	Yes	https://34slpa7u66f159hfp1fhl9aur1-wpengine.netdna-ssl.com/wp-content/uploads/2015/12/Nokia-Test-CSM-slides.pdf
49	Scrum Maturity Model	Academic	Hierarchical	High	Yes	[23]
50	Squad Health Check	Practitioners	Sub processes	Low	Unknown	https://spotifylabscom.files.wordpress.com/2014/09/squad-health-check-model2.pdf
51	Success Factors for Agile	Practitioners	Sub processes	Low	Unknown	https://improuv.com/scrum/publication/agile-sassessment-success-factors-self-assessment-teams
52	Unofficial Scrum checklist	Practitioners	Sub processes	Medium	Unknown	https://www.crisp.se/wp-content/uploads/2012/05/Scrum-checklist.pdf

progress. Each stage specifies goals that must be achieved to attain a particular business value through the use of an agile software development approach. The AAIM is meant as a method-independent tool 'for the adoption, assessment and improvement of an agile software development process'. It contains an agility measurement model to quantitatively measure the degree of agility, based on eighteen characteristics. Details on the operationalization of these characteristics are not available.

According to the authors the key features of the AAIM are the ability to 'facilitate the measurement and assessment of the current degree of agility of a software development organization and its processes' and to 'provide a roadmap for the establishment of a systematic agile software development environment and the systematic use of agile practices within it'.

2) Agile Adoption Framework (AAF): The AAF [18] also supports the second school of thought, deploying hierarchical maturity levels. The AAF consists of five hierarchical levels that are derived from the CMMI: collaborative, evolutionary, effective, adaptive and encompassing. It is meant to enable software development organizations in assessing their readiness for adoption of agile and to determine what set of agile practices should be introduced. The framework assesses the readiness by using the Sidky Agile Maturity Index (SAMI) using a four-step process: identifying discontinuing factors, project level assessment, organizational readiness assessment, and reconciliation.

The SAMI uses five principles that are based on the twelve principles of the Agile Manifesto [25]. For the operationalization of the agility levels these five SAMI principles have been translated into 40 practices and concepts that can be measured by 249 indicators at the development and management level. It has been positively reviewed by Gren et al. [26].

3) Agile Maturity Model (AMM): The AMM subscribes to the first school of thought, deploying on hierarchical maturity levels. It has been developed by Patel and Ramachandran [19] to 'improve and enhance the agile software development methodology and boost up the agile principles and objectives'. Inspired by the CMMI the model describes the agile position of an organization in five hierarchical levels: initial, explored goals, defined, improved, and mature. The four levels above the 'initial' level comprise eighteen key process areas that consist of 95 assessment criteria called 'best agile practices'. These criteria are used to map the agile position on fourteen different 'areas of improvement', which include agile principles such as simple design, collective ownership, and on-site customers.

4) Agility Index (AI): The AI belongs to the third school of thought, focusing on sub processes. According to Vinodh and Aravindraj [20] 'the recent trend in the manufacturing sector is to produce highly customized products in a shorter period of time to satisfy the niche needs of customers. In order to satisfy this requirement the Agile Manufacturing technique is being deployed.' Based on literature research and case studies Vinodh and Aravindraj [20] have proposed the AI 'to evaluate the current agile position of a firm'. Their model consists of four agile enablers: manufacturing strategy agility, manufacturing management agility, workforce agility, and technology agility. These four enablers comprise nineteen agile criteria, which in turn comprise 66 agile attributes.

5) Comprehensive Agility Measurement Tool (CAMT): The CAMT represents the third school of thought, focusing on sub processes. Erande and Verma [21] have developed their CAMT to 'determine the responsiveness of an enterprise to external turbulences, […] by measuring its ability to adapt their strategy to unpredictable changes'. The authors state that 'lean is a pre-requisite for being agile' but do not substantiate on this. However, based on this vision the authors have selected the 'Lean Aerospace Initiative – Lean Enterprise Self Assessment Tool (LAI-LESAT)' and adapted it to build their own CAMT model. It comprises the 'ten most critical agility enablers that are present in any enterprise independent of industry it is operating in', scoring organizations on their level of TAKT time, plant capacity, inventory, problem solving, e-manufacturing, continuous improvement, operational flexibility, quick changeover, internal customer satisfaction, and human resource management.

6) Objectives-Principles-Strategies framework (OPS): The OPS [22][24] adheres to the third school of thought, focusing on sub-processes. The OPS is strongly inspired by the CMMI [16] and the Agile Adoption Framework [18] but the authors state it is 'a primary disadvantage of these frameworks that a set of practices is "forced" on an organization at defined levels, which compromises the flexibility offered by agile methods.' Therefore they 'advocate the need for a more comprehensive agile assessment process that assesses the people, process, project and product characteristics of organizations adopting agile methods.' They have developed an approach to determine how capable an organization is in providing the supporting environment to implement an agile method, and to determine how effective the implementation of the agile method is in achieving its objectives.

7) Scrum Maturity Model (SMM): The SMM [23] represents the first school of thought, using hierarchical maturity levels. The SMM aims to offer a

'roadmap to lead and aid software vendor organizations in improving their development processes'. It focuses specifically on the scrum approach. Inspired by the CMMI, it is a hierarchical model using five levels: initial, managed, defined, quantitatively managed, and optimizing. Based on action research the model has been defined in four iterative cycles. It measures the five scrum maturity levels using eighteen objectives linked to 79 practices that are operationalized in 57 metrics.

8) Brief evaluation of the seven methods: The AAIM is still conceptual of nature, as it has not been applied to practice yet. Its operationalization has not been elucidated in the available literature. As such the conclusion is that suitability for marketing practice seems limited.

The AAF has only been applied to practice once and its data collection and analysis approach has not been elucidated in the available literature. A significant number of variables used in the model are irrelevant for answering the underlying research questions and are not always adequately measured.

Although the AI model creates the impression to be thoroughly substantiated, it is outside the scope of this research because the contents of the model are specifically tailored for production departments of technical manufacturing companies. This makes it fundamentally different from the other models examined, and is likely to be inadaptable to marketing practice. Therefore the model will not be part of further assessment.

As the AMM applies 95 'best agile practices' to fourteen 'areas of improvement', this results in 1,370 measurement points, making it an elaborate and overly complex method. The CAMT model is specifically aimed at measuring corporate agility at the strategic level. As such adaption to specific marketing practices will not be feasible. Furthermore, the model is insufficiently substantiated and therefore will not be part of further assessment.

The OPS has been applied to practice multiple times. Its operationalization as well as its data collection and analysis approach has been elucidated thoroughly in the available literature [22][24]. The variables used in the model seem to be sufficiently suitable for adaptation to marketing practice.

The SMM has not been applied in practice yet. Furthermore, the authors [23] do not present empirical evidence for the relevance of hierarchical levels to describe the agile position of software development organizations, and as such can not be further adapted to marketing practice.

Based on the analysis in stage 2 the AI and CAMT methods have been rejected. The five remaining methods that have been selected to continue to stage 3 are the AAIM, AAF, AMM, OPS, and SMM. These five methods have been assessed on the quality criteria as specified in Table 3 [5][8].

C. Stage 3: Quality Assessment of the Selected Methods

The results of the assessment are presented in Table 5. The scoring categories are as follows [5]:

- 0: the method does not meet the criterion (e.g. description is missing in the paper; not applicable);
- 1: the method meets the criterion insufficiently;
- 2: the method meets the criterion sufficiently;
- 3: the method meets the criterion well or fully.

The main conclusion from the quality assessment is that three of the methods (AAIM, AMM, and SMM) are still in a conceptual phase and have not been deployed in practice yet. Furthermore, the measures of the AAIM and AMM are insufficiently detailed and therefore these methods are unsuitable for the purposes of this research. The SMM is unsuitable as it focuses specifically on Scrum instead of on

Table V : Quality Assessment of the Five Selected Methods

Criterion \ Method	AAIM	AAF	AMM	OPS	SMM
1. Description of goals	2	3	2	3	2
2. Relevance of variables	2	2	2	3	2
3. Adequacy of measures	0	2	2	3	2
4. Definition of measures	0	3	0	3	3
5. Scoring method	0	3	0	3	2
6. Data collection	0	0	0	3	0
7. Data analysis	0	0	0	3	0
8. Inference	1	2	2	2	1

9. Deployment in practice	0	1	0	2	0
10. Independence	2	3	2	3	3
11. Comprehensiveness	3	3	3	3	1
12. Measurement level	3	3	3	3	3
13. Suitability for marketing practice	1	2	2	2	1

agile in general. The AAF meets most criteria sufficiently but has been used in practice only once in a limited setup. The OPS method meets all criteria sufficiently, well or fully and seems therefore the best candidate to be adapted to marketing practice by means of an Agile Marketing Maturity Model.

IV. BRIEF ANALYSIS OF THE OPS

The starting point for the OPS are the objectives as presented in the Agile Manifesto [25]. Based on further literature research, interviews with practitioners, observations, and empirical tests the OPS is built up of five objectives. These objectives are linked to nine principles that in turn are linked to seventeen strategies. For measuring the level of agility the seventeen strategies are operationalized in eighty indicators. The linkages between the objectives, principles, strategies and indicators have been established based on extensive academic evidence [22]. Figure 1 shows the linkages between the objectives, principles and strategies.

The indicators can be grouped into two categories. The first group measures the capability of the organization to facilitate the deployment of agile processes. Examples include practices such as planning, estimation, requirements management, prioritizing and customer feedback. The second group measures the effectiveness of agile processes within the organization. Examples include concepts such as time-boxing, customer satisfaction and team empowerment (Soundararajan, 2013).

V. CONCLUSIONS AND DISCUSSION

Whereas methods for measuring the agility level in software development are widely available, a method for measuring the agility level of marketing is lacking. This paper presented a step-by-step selection process for an agility maturity measurement method to be adapted to marketing practice.

A systematic literature review resulted in 52 agility measurements methods that proved to vary strongly in their measurement approach and the level of detail and quality they pursue. The methods can be categorized in three schools of thought:

- School 1: Methods focused on scaling practices, which largely identify on how to work agile in organizations with tens to hundreds of teams;

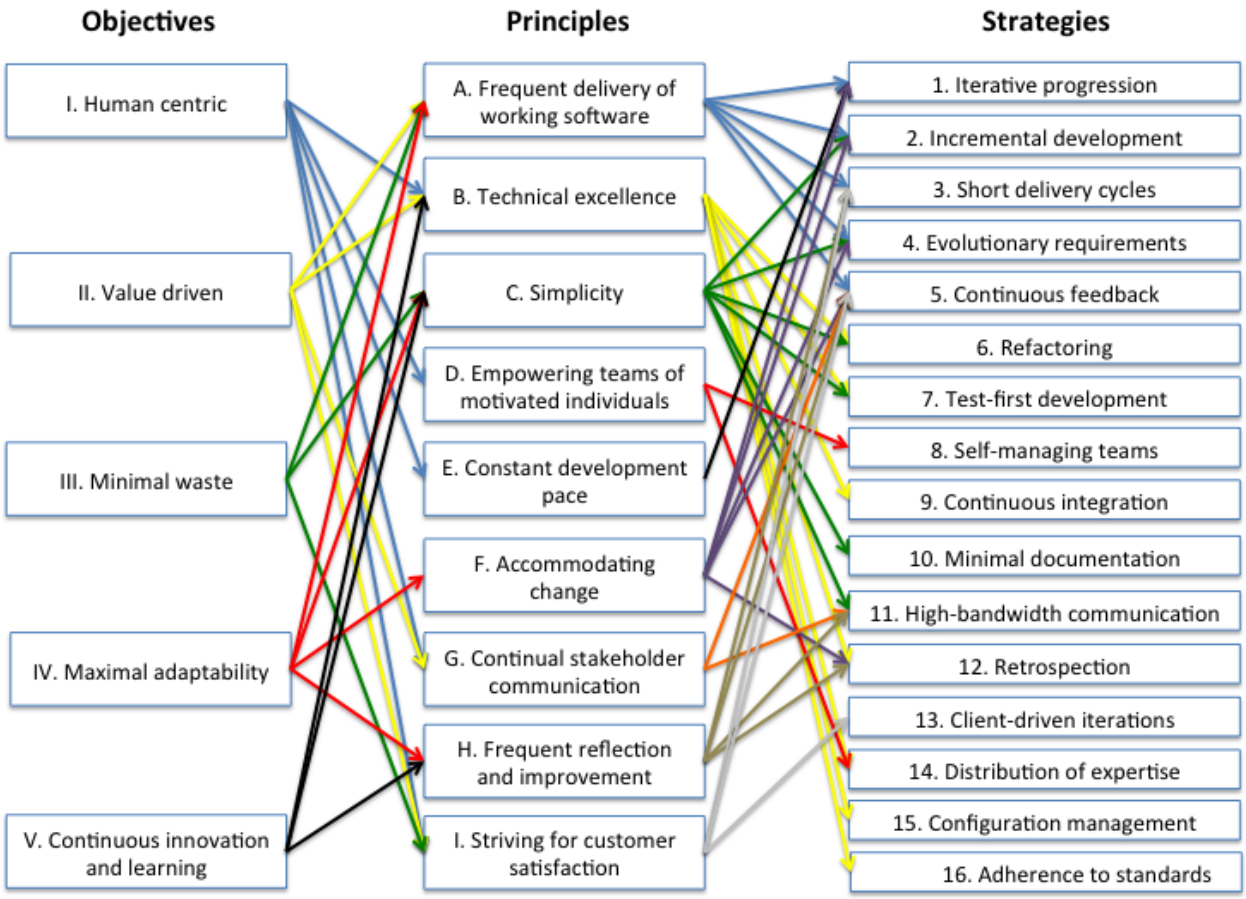

Fig. 1 Established Linkages in the OPS Framework

- School 2: Methods focused on hierarchical levels, which determine levels of maturity that build upon each other and to which organizations can comply or improve upon;
- School 3: Methods focused on sub processes, which identify deeper details and practices to be used by companies in improving their processes and practices.

Of the 52 methods 44 originate from practitioners. Of the eight methods that originate from academic research, one proved to be specifically aimed at lean and was therefore excluded. Of the remaining seven methods five proved to be relevant for further analysis. The main insight from this analysis was that four of these methods have either not been deployed in practice yet, or just in a limited way.

Based on this analysis the expectation is that the Objectives-Principles-Strategies framework (OPS) is the best-suited method for adaptation to an Agile Marketing Maturity Model, meeting all quality criteria sufficiently, well or fully. The OPS has therefore been selected as the best candidate for future adaptation to an Agile Marketing Maturity Model.

REFERENCES

[1] De Swaan Arons, M., van den Driest, F., & Weed, K. (2014). The Ultimate Marketing Machine. Harvard Business Review, (July-August), 1–11.

[2] Ewel, J., & Cass, J. (2012). Agile Marketing Manifesto. Retrieved from http://agilemarketingmanifesto.org

[3] Blank, S. (2013). Why the Lean Start-Up Changes Everything. Harvard Business Review, (May), 1–9.

[4] Hoogveld, M., & Koster, J. M. D. (2016). Implementing Omnichannel Strategies The Success Factor of Agile Processes. Advances in Management & Applied Economics, 6(2), 25–38.

[5] Kitchenham, B. (2007). Guidelines for performing Systematic Literature Reviews in Software Engineering.

[6] Dingsoyr, T., & Dyba, T. (2008). Empirical studies of agile software development : A systematic review. Information Ans Software Technology, 50, 833–859. http://doi.org/10.1016/j.infsof.2008.01.006

[7] Kotler, P., & Armstrong, G. (2015). Principles of Marketing. Prentice Hall.

[8] Kotler, P., Rackham, N., & Krishnaswamy, S. (2006). Ending the war between sales & marketing. Harvard Business Review, july-august, 68–78.

[9] Adalı, O. E., Özcan-top, Ö., & Demirörs, O. (2016). Evaluation of Agility Assessment Tools : A Multiple Case Study. In Software Process Improvement and Capability Determination - 16th International Conference, SPICE 2016, Dublin, Ireland, June 9-10, 2016, Proceedings (pp. 135–149). Springer International Publishing. http://doi.org/10.1007/978-3-319-38980-6

[10] Jalali, S., Wohlin, C., & Angelis, L. (2014). Investigating the Applicability of Agile Assessment Tools: A Case Study. Journal of System, 98(December), 172–190. http://doi.org/10.1016/j.jss.2014. 08.067

[11] Taromirad, M., & Ramsin, R. (2008). An Appraisal of Existing Evaluation Frameworks for Agile Methodologies. In Engineering of Computer Based Systems, 2008 - 15th Annual IEEE International Conference and Workshop (pp. 195–204). IEEE.
[12] Schweigert, T., Vohwinkel, D., Korsaa, M., Nevalainen, R., & Biro, M. (2014). Agile maturity model : analysing agile maturity characteristics from the SPICE perspective. Journal of Software: Evolution and Process, 26(5), 513–520. http://doi.org/10.1002/smr
[13] The LeSS Company. (2014). Large Scale Scrum (LeSS). Retrieved from http://less.works
[14] Scaled Agile. (2011). Scaled Agile Framework (SAFe). Retrieved from http://www.scaledagileframework.com
[15] Ambler, S. W., & Lines, M. (2012). Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise. IBM Press. Retrieved from http://www.disciplinedagiledelivery. com
[16] Chrissis, M. B., Konrad, M., & Shrum, S. (2011). CMMI for Development: Guidelines for Process Integration and Product Improvement. Addison-Wesley Professional.
[17] Qumer, A., Henderson-Sellers, B., & McBride, T. (2007). Agile adoption and improvement model. In Proceedings of the European and Mediterranean Conference on Information Systems, EMCIS 2007 (pp. 51–61).
[18] Sidky, A. (2007). A Structured Approach to Adopting Agile Practices: The Agile Adoption Framework. Virginia Polytechnic Institute and State University.
[19] Patel, C., & Ramachandran, M. (2009). Agile maturity model (AMM): A Software Process Improvement framework for Agile Software Development Practices. Int. J. of Software Engineering, IJSE, 2(I), 3–28. http://doi.org/10.4304/jsw.4.5.422-435
[20] Vinodh, S., & Aravindraj, S. (2012). Agility evaluation using the IF–THEN approach. International Journal of Production Research, 50(24), 7100–7109. http://doi.org/10.1080/00207543.2011. 627390
[21] Erande, A. S., & Verma, A. K. (2008). Measuring Agility of Organizations – A Comprehensive Agility Measurement Tool (CAMT). International Journal of Applied Management and Technology, 6(3), 31–44. Retrieved from http://www.publishing.
waldenu.edu/ijamt/vol6/iss3/3/
[22] Soundararajan, S. (2013). Assessing Agile Methods : Investigating Adequacy, Capability, and Effectiveness.
[23] Yin, A., Figueiredo, S., & Mira da Silva, M. (2011). Scrum Maturity Model - Validation for IT organizations' roadmap to develop software centered on the client role. In Proceedings of the ICSEA (pp. 20–29).
[24] Soundararajan, S., & Arthur, J. D. (2011). A Structured Framework for Assessing the "Goodness" of Agile Methods. In Engineering of Computer Based Systems (ECBS), 18th IEEE International Conference and Workshops (pp. 14–23). IEEE. http://doi.org/10.1109/ECBS.2011.26
[25] Beck, K., Beedle, M., Bennekum, A. van, Cockburn, A., Cunningham, W., Fowler, M., … Thomas, D. (2001). Manifesto for Agile Software Development. Retrieved from http://agile
manifesto.org
[26] Gren, L., Torkar, R., & Feldt, R. (2015). The prospects of a quantitative measurement of agility: A validation study on an agile maturity model. The Journal of Systems and Software, 107, 38–49. http://doi.org/10.1016/j.jss.2015.05.008