

RESEARCH OUTPUTS / RÉSULTATS DE RECHERCHE

AM-QulCk : a measurement-based framework for agile methods customisation

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AM-QuICK: Agile Methods Quality-integrated Customisation framework

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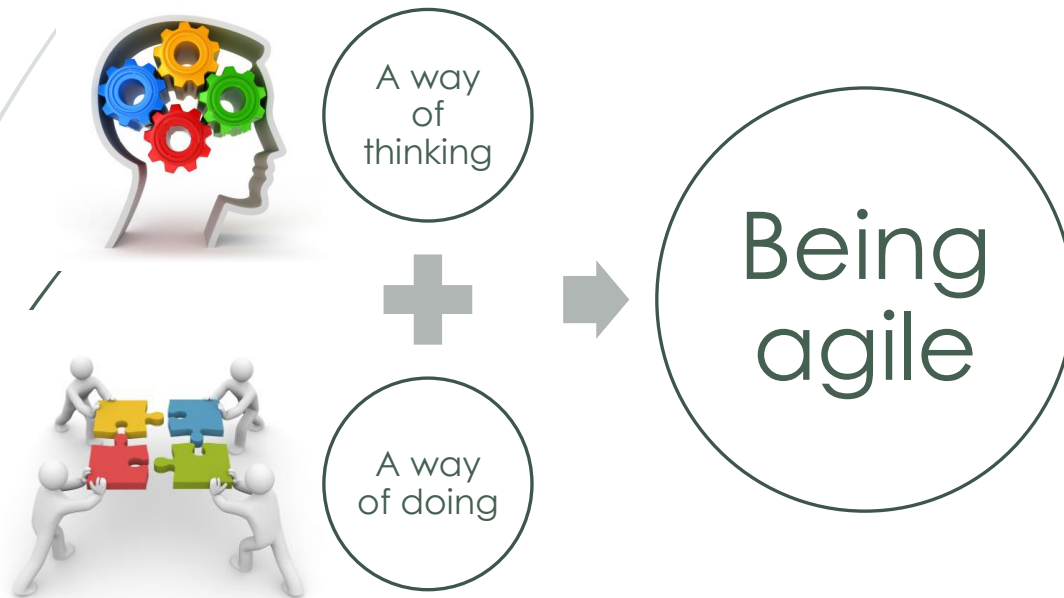
Overview

1. Agile adoption challenges
2. Research objectives
3. Related works
4. AM-QuICK Overview
5. Case study
6. Future works

1. Agile adoption challenges

- 1.1 Agile adoption in a nutshell
- 1.2 Common issues
- 1.3 Keys for addressing agile adoption challenges

1.1 Agile adoption in a nutshell ...



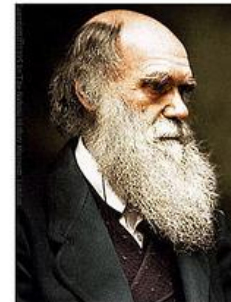
- A way of thinking : Values + Principles
 - **Individuals and interactions** over *processes and tools*
 - **Working software** over *comprehensive documentation*
 - **Customer collaboration** over *contract negotiation*
 - **Responding to change** over *following a plan*
- A way of doing : Methods + Practices
 - *Iterative, Incremental* and *adaptive* development
 - Self-organized, cross-functional teams
 - Time-boxed, iterative approach, etc.

1.2 Common agile adoption issues

- **No assessment of the readiness of the organisation :**
 - Why to go for agile?
 - Is the environment favourable (culture, organisation structure ...) ?
- **Lack of objective decision making indicators / tools :**
 - The organisation diagnosis is often based on external consultant non-quantified experience instead of team intrinsic knowledge and neutral quantitative elements
- **No tailoring and no suitability assessment of the chosen method :**
 - Unused or non applicable subset practices
- **No capitalisation on the previous agile adoption experiences / tailoring attempts**
- **No assessment of the process / product quality**
 - Quality is largely assumed to be a natural and obvious outcome of the enacted agile process
- **Agile processes are often monolithic : they rarely evolve with environment change**
 - Paradoxically, agile practitioners promote the evolution of the software but do not focus enough on the changes that may affect the agile process itself

1.3 Important keys to keep in mind ...

- Understanding **the readiness of the organisation** is crucial to minimize failure risk
- Agile methods should be **customised** and **continuously assessed** in order to fit the specific context
- Agile customisation experiences should be **capitalised**
- Change is inevitable : The **enacted agile process should evolve incrementally**, just like the software evolve



It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.

- Charles Darwin

2. Literature references and related works

► **Agile Customisation studies :**

- Most of the studies are not reusable / generalisable : no automation techniques are provided
- No assessment and refinement after the initial customisation :
 - e.g., [mikulenas et al., 2011]

► **Situational ME :**

- « Constructing development methods tuned to the situation or the project and organisation at hand by selecting, tailoring and assembling appropriate components »
- Existing SME metamodels : SPEM, SMSDM, OPF, etc.

► **Model-driven process evolution :**

- In order to enable the evolution of the process over time and the co-evolution with the software, we need to be able to capture the interactions between the modelled process and the enacted process

➡ Need to raise the abstraction level : an agile metamodel

3. Research objectives

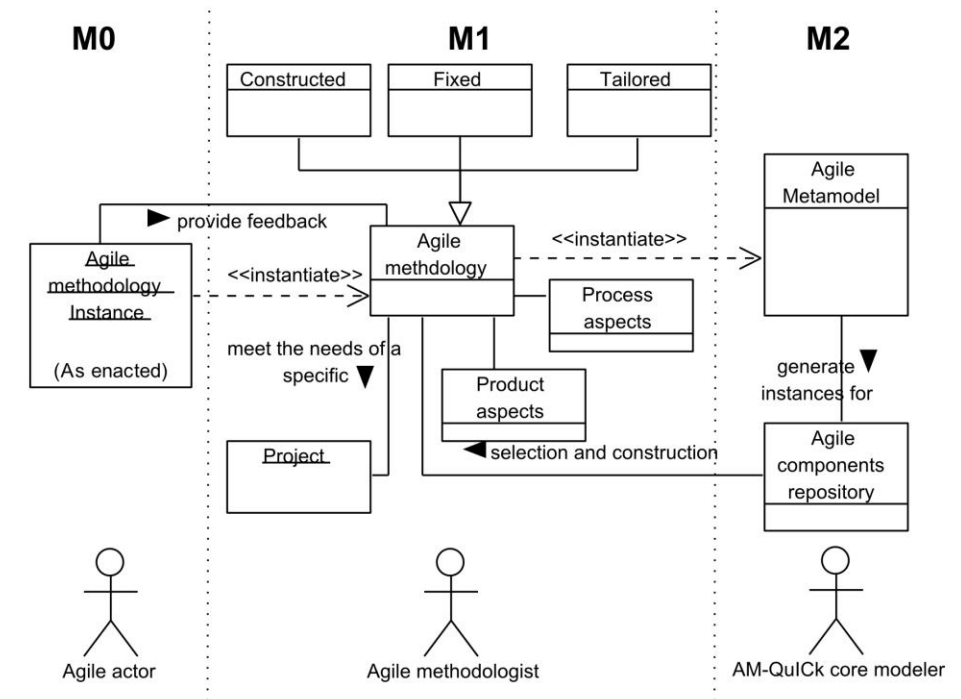
- **Enlarging the scope** of existent agile methods customisation studies
- Investigate **a high-level / generic** approach for :
 - organisation specific-context study :
 - Identification of agility needs
 - Readiness
 - Risk analysis ...
 - the design of a context-specific agile method
 - suitability assessment
 - refinement overtime
- ... thanks to decision making assistance, process and product quality indicators and metrics feedbacks

4. AM-QuICK Overview

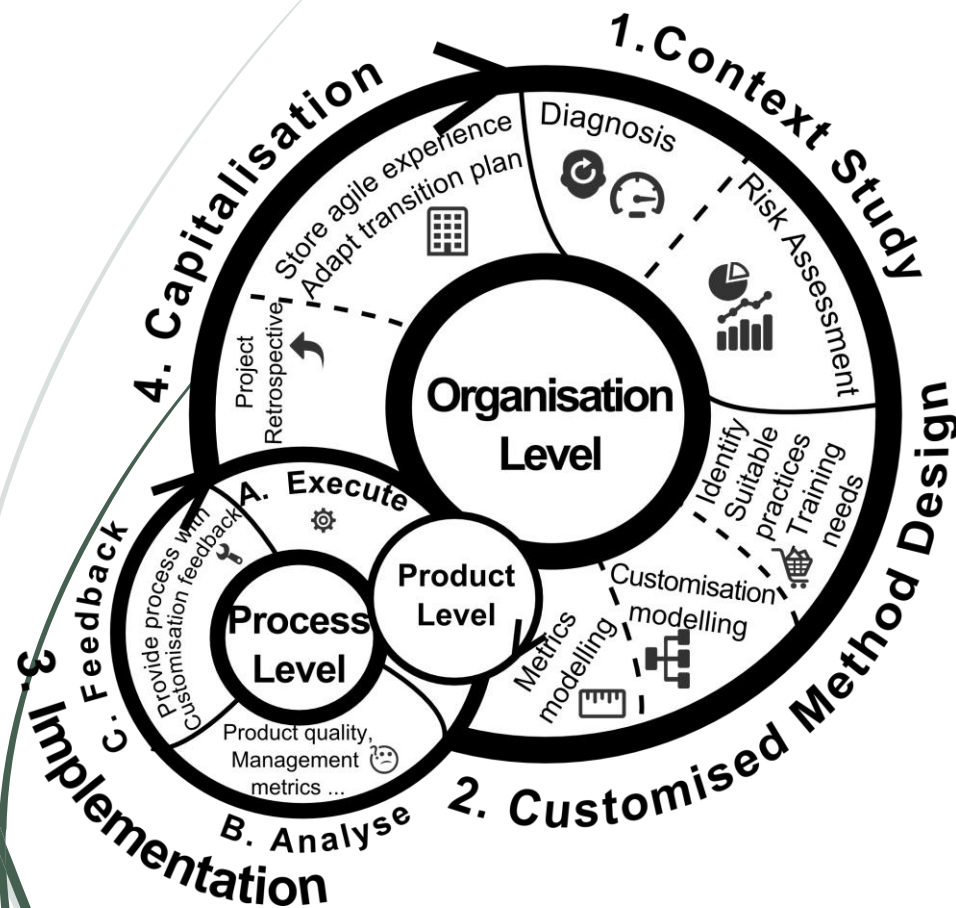
- 4.1 Overview
- 4.2 AM-QuICK lifecycle
- 4.3 AM-QuICK Agile metamodel
- 4.4 AM-QuICK mapping with MoCQA
- 4.5 AM-QuICK measurement levels

4.1 AM-QuICK overview

- The **A**gile **M**ethods **Q**uality **I**ntegrated **C**ustomisation **F**ramework
- A framework based on the **QIP** and on **Situational ME**
- **AM-QuICK** aims at continuously assist during :
 - **Design of the customised method** by elements composition
 - **Design of the Product and Process quality indicators** and the **related metrics**
 - Design of the **refinement rules** that will allow evolution and co-evolution
 - Design of the **assessment rules**



3.2 AM-QUICK Life-cycle



3 levels :

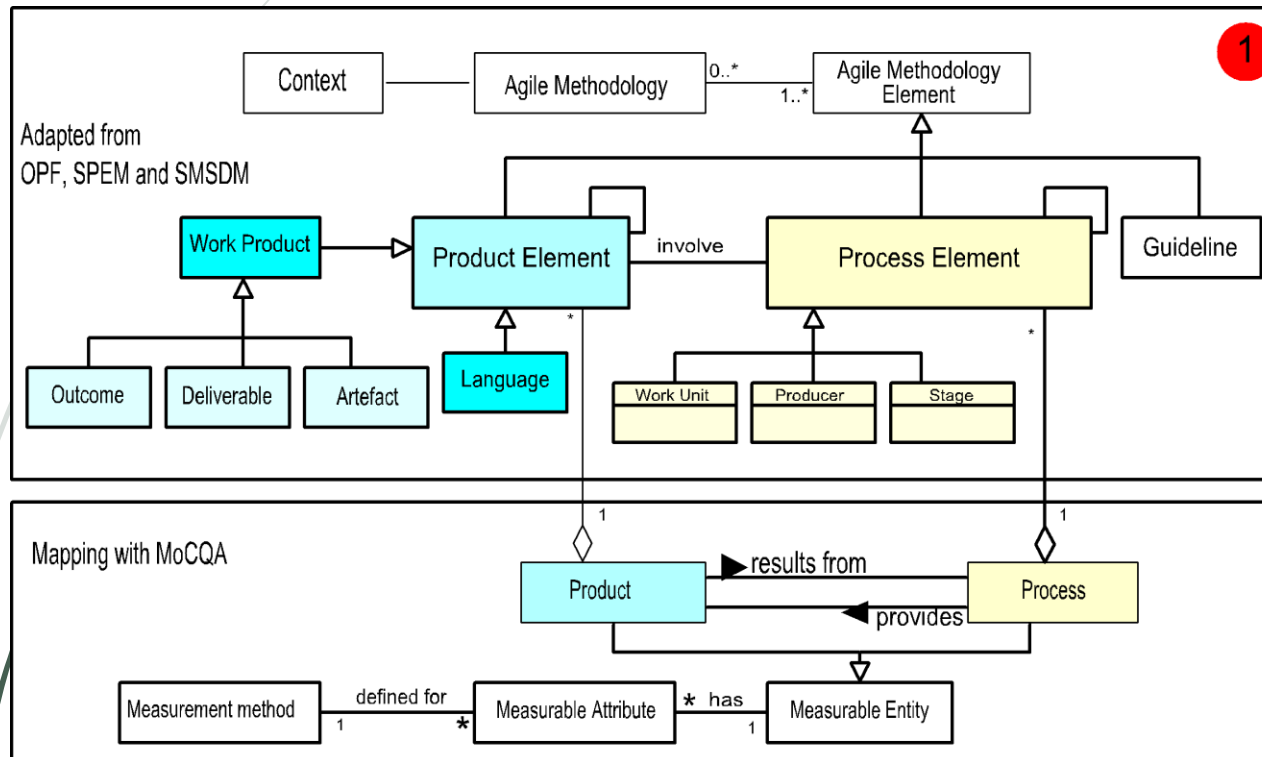
- Organisation strategy level
- Process enactment level
- Working product level

Any effort taken in a product may result in a revision of the process for the next iteration => co-evolution

The main cycle consists of the following steps :

- Context analysis** : understanding the context through interviews, GQM-based diagnosis, risk assessment tools, etc.
- Customised agile method design** : Identification of suitable practices, design of the method elements, identification of evolution rules and assessment rules, design of correspond quality factors and metrics
- Implementation** : Execution of the designed process, analysis of the metrics feedback to allow later adjustments
- Capitalisation** : Future incoming projects have to profit from the gained experience

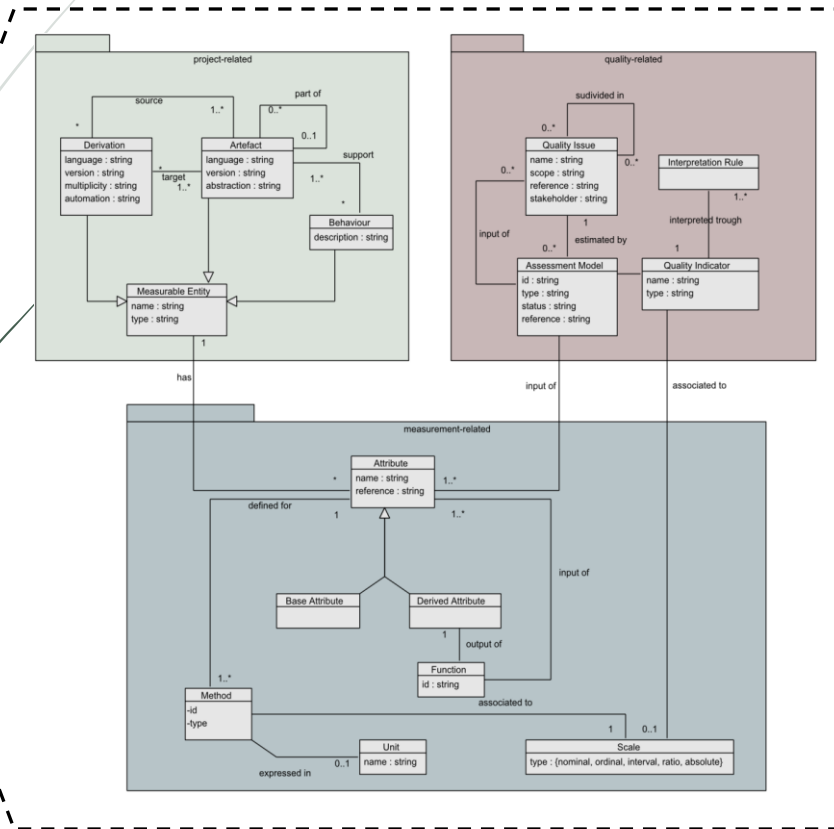
3.3 AM-QuICK agile metamodel



- AM-QuICK requires a metamodel which serves as a guide for agile methods design
- Adapted from SPEM and SMSDM
- Integrated a quality assessment metamodel (MoCQA)

4.4 AM-QulCK mapping with MoCQA

MoCQA
quality
metamodel



- The Model-Centric Quality Assessment approach :
 - theoretical framework
 - based software measurement principles
 - quality model approach
 - continued quality assessment of software
- Generation of customised quality models
 - rely on a quality metamodel
- Quality-related
 - Definition or reuse of a hierarchy of quality factors
- Measurement-related
 - Definition or reuse of measurement method
 - Associated to the quality factors
- Project-related concepts
 - Project vs product
 - Software ≠ black-box
 - Scope = project ≈ ecosystem

4.5 AM-QuICK measurement levels

➤ Product level metrics :

➤ Code metrics :

- Cyclomatic complexity, coding standards violation, number of defects, number of refactors , code coverage ...

➤ Design metrics

- Code dependencies, abstractness ...

➤ Testing metrics

- Percentage of test coverage, number of automated test cases,

➤ Process level metrics :

➤ Team management :

- Product ownership health, team technical health, agile knowledge degree, ...

➤ Work progress :

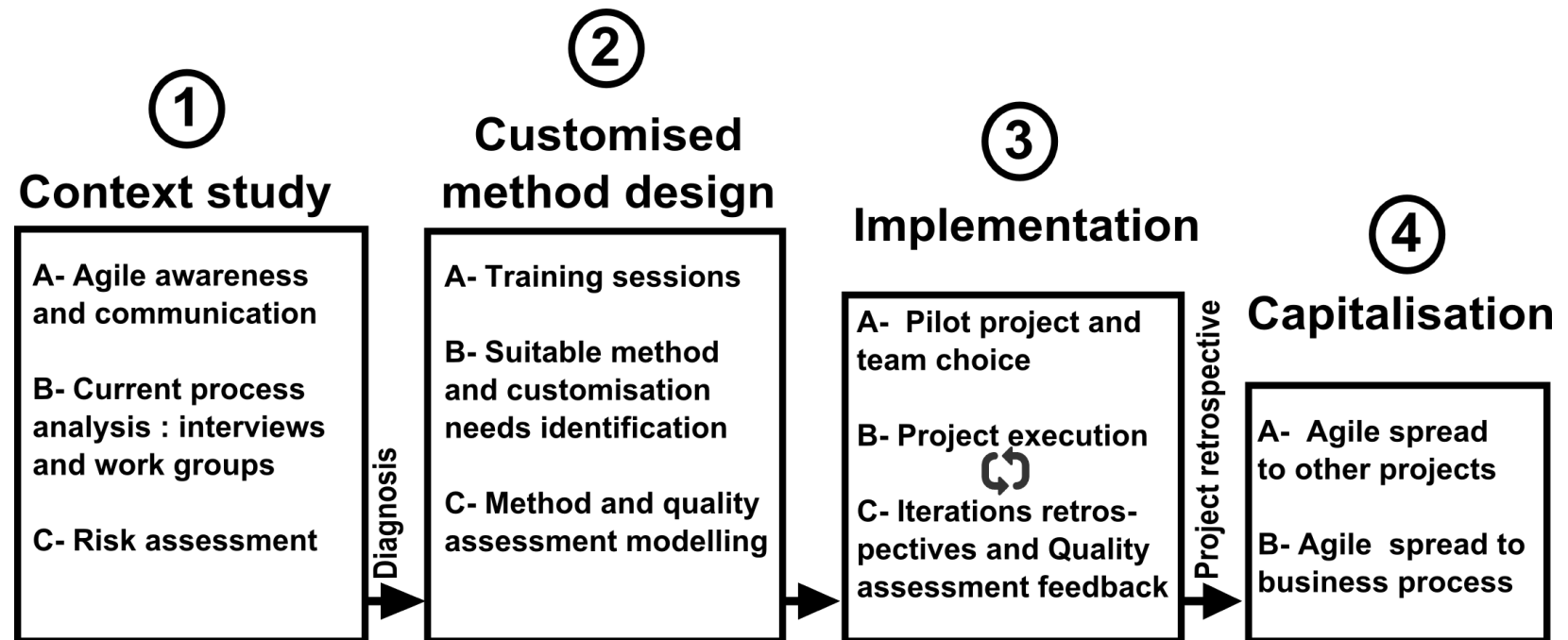
- Actual velocity, planned velocity, number of stories planned, number of accepted stories ...
- Backlog size, feature business value estimation, work unit estimation, ...

4. AM-QuICK implementation : Case study

4.1 Organisation context

- A middle-sized organisation of 2,300 employees
- IT service : 84 people, mainly focused on the IT activities of the wallon payment agency in Belgium
- 5 entities, 2 entities covered by the study : DEV and PAD
- DEV has two units : project teams unit (CePRO) and Maintenance unit (CeSAM)
- PAD : Five units organised by business roles : Architecture, Quality insurance, Developers, Project managers, analysis
- 15 projects in progress

4.1 Organisation context : transformation roadmap



4.2 Data collection

- Interviews :
 - 1h – 2h per. Business role unit
 - Aim :
 - Identify strengths and weaknesses of the current process
 - Identify improvement opportunities by implementing agile
 - building urgency, detecting change reluctance ...
- 2 questionnaires :
 - 15 project teams
 - 1st : Analyse tge current process in terms of agility degree :
 - Team organisation
 - Project managment
 - Specification / requirements analysis
 - Development practices
 - 2nd : Indentify the desired and/or applicable agile practices
- Project retrospective using the affinity diagram (KJ diagram)

4.2 Data collection : questionnaires construction methodology

- Based on literature review, the basic agile characteristics were extracted and classified into 4 sections ;
 - Team organisation
 - Project management
 - Specification / requirements analysis
 - Development practices
- Each section include from 3 to 7 characteristics
- A set of questions are asked to assess the team's score on each characteristic
- Questions are answered based on the four point likert scale ; Strongly agree, agree, disagree, strongly disagree

Pratiques et outils agiles

L'objectif de cette enquête est d'étudier les connaissances disponibles et celles à acquérir en termes de valeurs, pratiques et outils agiles. Les résultats permettront de définir les objectifs de la formation et choisir (en adaptant) la méthode agile adéquate aux besoins du SPI.

Nom *

Prénom Nom

Adresse électronique

Cellule *

CePRO

Equipe-Projet(s) *

Avez-vous une expérience en développement agile, si oui, depuis combien de temps ? *

☒ Aucune expérience

☐ 0 - 6 mois

☐ 7 - 12 mois

☐ Plus d'un an

☐ Plus de deux ans

Évaluez les pratiques suivantes selon le degré de changement souhaitable et réaliste.

| | Non souhaitable | Peu souhaitable | Neutre | Souhaitable | Très souhaitable | Je ne connais pas |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.1. Responsabilité Collective du code (Collective Ownership) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.2. Forte implication du client | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.3. Participation active du chef de projet (Plannings, démos, rétrospectives, ...) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.4. Auto-organisation de l'équipe | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.5. Itérations courtes et "timeboxées" | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Grille d'analyse agile – GT 'FUNDP – SPW'

L'objectif de ce document est de réaliser une analyse de type SWOT (Strengths, Weaknesses, Opportunities, Threats) du processus actuel de développement et de management. Les résultats de cette grille d'analyse permettront d'identifier les prédispositions à la transition agile, mais aussi les foyers de résistances et risques face au changement. Les résultats serviront à définir les objectifs et priorités de la transition et ainsi établir un plan d'action.

1 Management de l'équipe et du projet 2 Processus de développement

Nom *

Prénom Nom

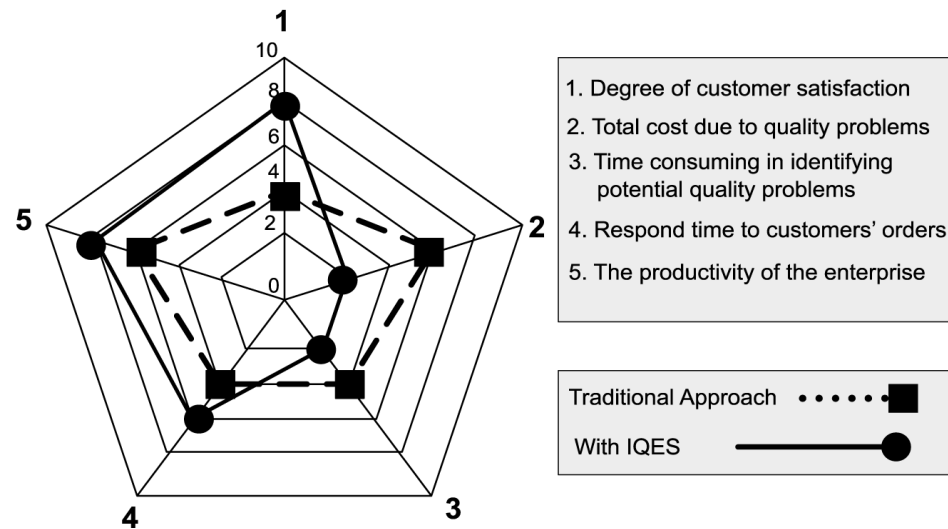
Cellule – Equipe-Projet(s) *

Management de l'équipe : Évaluez les énoncés suivants. Cocher Non applicable (N/A) si vous estimez que la pratique en question ne peut pas être appliquée à cause de l'organisation des cellules ou autre raison à citer dans la partie « commentaires additionnels » *

| | Pas du tout d'accord | Pas d'accord | D'accord | Tout à fait d'accord | N/A |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1.1. Les membres de l'équipe travaillent ensemble aussi longtemps que possible | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.2. Les membres de l'équipe travaillent de manière exclusive sur le projet en cours | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.3. Toute personne concernée par le projet (depuis la spécification jusqu'au produit final) est incluse dans l'équipe (même cellule, même équipe-projet) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.4. Le management établit des objectifs, mais n'impose pas aux membres de l'équipe la manière de les atteindre | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.5. Les membres n'ont pas à travailler sur des tâches qu'ils estiment à faible valeur ajoutée | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 1.6. Le management change les priorités de l'équipe en cours d'itération (ou étape) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

4.3 Current process diagnosis

- Interviews outcome (Projet IDEES) :
 - Lack of involvement of the business units : their life-cycle is not aligned with team iterations
 - Lack of guiding tools and indicators to assess the agile effectiveness
 - Roles ambiguities
- Agility degree matrix :



4.4 Risk analysis

| | Helpful to achieving the objective | Harmful to achieving the objective |
|-----------------|---|--|
| Internal Origin | <ul style="list-style-type: none"> • Team autonomy (Q1-1.2.1, Q1-1.2.3) • Team problems management (Q1-1.3.2) • Good technical practices (Q1-4, Q2-3) • Iterative lifecycle (Q2-2.5), (I) • High-level architecture (Q1-3.1, Q1-3.2, Q2-2.12), (I) | <ul style="list-style-type: none"> • Lack of process visibility (Q1-2.2.3) • Inflexibility to change (I) • Long iterations (Q1-2.1.4) • Inter-team communication (Q1-1.1.3) • Tasks estimation (Q1-2.2.1, Q1-2.2.2) • Business and technical stakeholders cooperation (Q1- 3.1, ..) • Non-collective specification and task estimation (Q1-2.2.1) • Organisation structure (Q1-1.1.1 , Q1-1.1.2) and (I) • Agile knowledge (Q2-1, Q2-2) |
| External Origin | <ul style="list-style-type: none"> • Awareness of the need to change Q2-2, (I) • IDéES agile experience (I) • Management enthusiasm (I) • Management enthusiasm (I) | <ul style="list-style-type: none"> • Customer implication (Q1-2.2.4) and (I) • Business stakeholders implication (I) • Contract negotiation (I) • Budget management (I) • Some business units reluctance (I) |

Conclusion and Future works

► AM-QuICK :

- A general approach developed to help agile methods adoption, customisation and refinement through improvement cycles
- Relies on SME and QIP

Future works

► AM-QuICK case study – next steps :

- Pilot project selection
- Suitable agile practices identification
- Customised agile method design

► Enrich the AM-QuICK metamodel :

- In order to be able to capture the organisation context
- In order to include dynamic behaviour between its elements so that it will be able to represent the interaction between product / process elements , and therefore their co-evolution
- Establishment of the catalogue of reusable agile product and process elements, metrics, practices, tools ...
- This catalogue (actually under construction), will be used as an input for effective and informed methodological decisions
- => Knowledge data base to use in the construction of the refinement and assessment rules



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