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Agile outside of Information Technology

Literature review and police policy project experiment

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**Agile outside of Information Technology:
Literature review and police policy project
experiment**

Julien DENIS

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Even for such a personal work like this master's thesis, it would not have come to fruition as it does today without the input of other well-intentioned people. No matter what project you undertake, you are never absolutely alone in seeing it through.

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Abstract

It is rare for a project to progress without surprises or changes. An Agile approach aims not only to accept these challenges, but also to respond to them and quickly make the required adaptations so that the project remains in line with the beneficiary's needs. This approach is often associated with software development, but it can in fact be applied to any type of project: manufacturing bathtubs and cars, teaching music, sales team performance,...

Various conditions create a favorable climate for the realization of an Agile project: tolerance for variable efficiency, context of permanent change, a relatively high level of complexity, willingness to collaborate, open-mindedness and managerial support.

We experimented with the implementation of an Agile approach within a police zone in Belgium, and more specifically within the framework of the zonal security plan follow-up. This plan determines the priorities of the police zone in terms of security phenomena and internal operations management.

We proposed and tested a model in which we adapted Scrum to the context of the organization in order to build teams in charge of putting into action the objectives determined in the plan. Rather than following the traditional waterfall approach via a series of analyses and plans that ultimately establish the actions that should be carried out by the field staff, our model places these field actors at the center. They are responsible not only for thinking about how best to achieve the desired outcome, but also for helping to implement them.

Although this experiment was interrupted for reasons unrelated to the Agile approach, we can draw some observations to improve the replication of a similar approach, such as the attention to be paid to the environmental elements in order to maintain timeboxing.

Keywords: Agile, Scrum, Police, Plan, Policing, Non-software, Non-IT, Project management

Résumé

Il est plutôt rare qu'un projet se déroule sans surprise ni changement. Une démarche Agile vise non seulement à l'accepter mais aussi à y répondre et réaliser rapidement les adaptations requises afin que le projet reste conforme aux besoins du bénéficiaire. Cette approche est souvent associée au développement logiciel mais reste toutefois applicable à tout type de projet: fabrication de baignoires, de voitures, enseignement de la musique, performances d'une équipe de vente,...

Diverses conditions créent un climat favorable à la réalisation d'un projet sur un mode Agile: tolérance à une efficience variable, contexte de changement permanent, niveau de complexité relativement élevé, collaboration essentielle, ouverture d'esprit, soutien de la direction.

Nous avons expérimenté l'implémentation d'une démarche Agile au sein d'une zone de police en Belgique, et plus particulièrement dans le cadre du suivi du plan zonal de sécurité. Ce plan détermine les priorités de la zone de police en termes de phénomènes de sécurité et de gestion interne.

Nous proposons un modèle dans lequel nous avons adapté Scrum au contexte de l'organisation en vue de constituer des équipes chargées de mettre en action les objectifs déterminés dans le plan. Plutôt que suivre l'approche traditionnelle en cascade via une série d'analyses et de plans établissant en fin de compte les actions que devraient réaliser le personnel de terrain, notre modèle place ces acteurs de terrain au centre. Ils sont chargés non seulement de la réflexion visant à déterminer la meilleure manière d'atteindre le résultat visé, mais aussi de contribuer à leur mise en oeuvre.

Ce modèle a fait l'objet d'une expérimentation. Quoique celle-ci ait été interrompue pour des raisons indépendantes de la démarche Agile elle-même, nous pouvons en retirer quelques observations en vue d'améliorer la reproduction d'une démarche semblable, telles que l'attention à accorder aux éléments d'environnement pour parvenir à maintenir des cycles de temps constants.

Mots-clés: Agile, Scrum, Police, Plan, Politique, Non logiciel, Non IT, Gestion de projet

Contents

Introduction

We all want to achieve goals. Whether it is personal or professional, alone or in a group, regardless of the sector of activity. Obviously, if we are looking to achieve a goal, it is because in essence we have not yet accomplished it. There is therefore a series of steps between the current state and the one we want. This process can be described as project management: with a certain objective in mind, we organize and use various resources to reach it "as well as possible". Behind this expression is a balance to be determined between different notions such as quality, speed, cost, satisfaction,...

Different methods of managing a project exist, with particularities according to certain sectors. In the IT field, and software development in particular, some methodologies are based on an approach called "Agile", whose values and fundamental principles were outlined in a manifesto published in 2001. Even if these values and principles are particularly well adapted to the IT domain, it is quite possible to extend them to other sectors, including those that are not at all linked to technology or product manufacturing.

The challenge of our thesis is to consider the extent to which an Agile approach can be implemented in the context of projects other than software development. We have conducted a review of the scientific literature on this subject in order to draw lessons from it. Moreover, we have implemented an Agile approach within the context of a police policy plan monitoring. This thesis is structured as follows.

In Chapter 1, we introduce the origins of the Agile approach in software development. What were the problems identified in the way of managing IT projects? What does the Agile manifesto include? What are the benefits of an Agile approach?

In Chapter 2, we explain how our thesis is part of a continuity of research initiated by other authors. We also detail the methodology followed to carry out our review of the scientific literature: the research questions raised, the academic databases consulted, the criteria used to carry out our research, the procedure for processing the information, the results obtained, and the use made of the various scientific articles within each chapter of this thesis.

In Chapter 3, we discuss the different cases of an Agile implementation outside of software development, as drawn from our literature review: data center migration, bathtub or car manufacturing, medical product prototyp-

ing, online course curriculum development, teaching different courses for different levels of schooling (from schools to university), teaching music, transforming a local political council, improving a division of a financial group, writing a book, conducting scientific research, improving the efficiency of sales departments,... Furthermore, we will consider various methodological contributions such as: how to import Agile into a Stage-Gate model, an adaptation of the manifesto for teaching, links with pedagogy, a model to revise supply chain management in the medical environment, a generic project management model,...

In Chapter 4, we bring together the various favorable elements identified in an organization's environment for the integration of an Agile project management model to be profitable. In particular, the tolerance for a certain degree of inefficiency in terms of performance, a changing context in terms of the objectives to be achieved, a certain minimum level of complexity, good collaboration between the various players, an open mind and strong support from management.

In Chapter 5, we list the various definitions of Agile. Even though the concept has been used for many years, it is still quite difficult to make it operational, especially in areas outside IT. In addition to the elaboration of the definition itself, several authors have also tried to identify the characteristics that make Agile singular and some have even developed a generic conceptual model.

In Chapter 6, we detail the experiment we conducted in a Belgian police unit. Each unit has to define long-term priorities (over a few years) in a security policy and execute actions to make them concrete. After explaining how the policy is normally put into practice, we propose a new, Agile based model to implement and follow up. We also relate the observations we have drawn from this experience.

In Chapter 7, we discuss this thesis. Everything can be improved and this paper is of course no exception. We consider ways to improve the approach we have taken. This concerns the literature review, the experiment and future perspectives.

Finally, let us note that, except in the quotations where we leave the original syntax, we have chosen to capitalize the first letter of the word "Agile". This is not to artificially "grow" this notion, but simply to make the difference between the movement linked to the Agile manifesto of 2001 and the simple adjective of common language.

Chapter 1

Agile origins

1.1 Software engineering

The sole purpose of a computer processor is transforming bits. Bits are the primary logical material used by both computer professionals and simple users. Within the field of computing science, some professionals are dedicated to writing programs. A program is nothing more than telling the computer what it should do, *i.e.* how it should transform the bits it receives from one interface and output the result to another interface. In other words the processor is just a kind of automated binary transformer that does not care about what it is asked to do. To guarantee the quality of the program, it must be checked by a human eye, particularly in creating programs devoted to the validation of other programs in some ways.

Considering the unavoidable complexity of working in groups, it is necessary to frame the way programs are elaborated. The name of this discipline is software engineering and it consists of methodologically looking for the most efficient steps between the idea of creating a software program and observing it running in accordance with the beneficiary's needs.

"The dynamics that drive product development projects out of control are amplified in software development because software is less tangible and unconstrained by physics. Therefore, functional specifications are more likely to over-reach what can be accomplished realistically with available resources while underestimation is more likely. Furthermore, functional changes are expected to be easier in software than in hardware" [29, p.41].

Software engineering as described above is quite close to the broader approach of "project management". The latter is more general and does not only focus on software development. Moreover a project is traditionally considered as temporary in that it has a defined beginning and end in time. To summarize the main elements constituting a project: *"A project is a sequence of unique, complex, and connected activities that have one goal and purpose and that must be completed by a specific time, within a certain*

budget, and according to a specification. A project comprises a number of activities that must be completed in some specified order, or sequence. An activity is a defined chunk of work" [36, p.716].

A problem with traditional project management is that it *"often requires holistic awareness of all requirements in the beginning, so adjustements are extremely time consuming with errors compounding"* [60, p.246]. But a software development project needs to be regularly refined as long as it is in use (new needs, new features, bug fixing, etc.). More generally, *"There is no perfect project management system suitable for each type of project. Also, there is no system that would suit every manager and would be convenient for all team members"* [36, p.716].

"The underlying problem with most product development plans is that they measure progress based on the plan and are unable to account for product quality and undiscovered rework in their progress measures. Consequently, quality shortcomings accrue until the need for rework delays progress" [29, p.42]. If a misinterpretation of a requirement or a new requirement arises at some point of the project development, each of the previous phases should be reconsidered based on the new information. However, this initiates a vicious circle as it generates delays and puts the project under schedule pressure. *"Developers working under schedule pressure are more likely to make errors and to skip quality-inducing steps [...] thereby increasing the cycling of rework"* [29, p.42-43].

Although the two disciplines remain different, they are quite permeable. Software engineering was first inspired by the principles of project management. Subsequently, the methodological particularities developed in software creation opened new ways of managing projects. The Project Management Institute (PMI) has always been strongly oriented towards a waterfall approach through its well-known "Project Management Book of Knowledge" (PMBoK). Nevertheless, for a few years now, it has offered a "PMI Agile Certified Practitioner (PMI-ACP)" certification *"that recognizes practitioners in the use of agile project management methods focused on software development projects"* [14, p.22]. This leads us to define what Agile project management is: *"an approach based on a set of principles, whose goal is to render the process of project management simpler, more flexible and iterative in order to achieve better performance (cost, time and quality), with less management effort and higher levels of innovation and added value for the customer'* [14, p.22].

1.2 Agile manifesto

"Quite frankly, the Agile approaches scare corporate bureaucrats - at least those that are happy pushing process for process' sake versus trying to do the best for the "customer" and deliver something timely and tangible and "as

promised" - because they run out of places to hide. The Agile movement is not anti-methodology, in fact, many of us want to restore credibility to the word methodology. We want to restore a balance. We embrace modeling, but not in order to file some diagram in a dusty corporate repository. We embrace documentation, but not hundreds of pages of never-maintained and rarely-used tomes. We plan, but recognize the limits of planning in a turbulent environment" [5]

The Agile manifesto [5] is neither a methodological achievement nor the beginning of divine inspiration. It is more of a beacon in our history which, on the one hand, highlights the essence of "good" past approaches to software development and, on the other hand, illuminates the future by promoting their use. The manifesto itself is a fairly short document written by seventeen independent thinkers about software development who named themselves "the Agile alliance". The manifesto contains four values and twelve principles.

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- *Individuals and interactions over processes and tools*

- *Working software over comprehensive documentation*

- *Customer collaboration over contract negotiation*

- *Responding to change over following a plan*

That is, while there is value in the items on the right, we value the items on the left more.

We follow these principles:

1. *Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.*

2. *Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.*

3. *Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.*

4. *Business people and developers must work together daily throughout the project.*

5. *Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.*

6. *The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.*

7. *Working software is the primary measure of progress.*

8. *Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.*

9. *Continuous attention to technical excellence and good design enhances agility.*

10. *Simplicity – the art of maximizing the amount of work not done – is essential.*

11. *The best architectures, requirements, and designs emerge from self-organizing teams.*

12. *At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.*

In summary, Agile methods imply abandoning a "command-and-control" management style [49]. "*Whereas traditional methods focus on upfront planning and strict management of change, agile methods are designed to embrace uncertainty and change as a permanent state that must be accepted and managed*" [26, p.1104]. Changes are simply a fact of life and should be incorporated into an ordinary workflow [29, p.43].

1.3   Agile approaches

There are multiple ways to implement the Agile manifesto's philosophy. Let us recall that the manifesto is "only" a statement of values and principles, not a directly applicable methodology. In fact, the manifesto itself came a few years after some "new software project management" methods were used. We observe a kind of cycling movement: the Agile manifesto unified a philosophy influenced initially by existing methods and then indirectly projected a point of reference, like a lighthouse, for these movements and others to converge on.

However, there is no "Agile compliant" standard and criteria to meet. Each Agile approach makes use of some tools and practices to implement its vision of project management. Behind Agile is a kind of continuum ranging from a management point of view to a toolbox conception [26, p.1103]. "*Further, due to their practical nature, Agile methods can be difficult to understand, and to delineate what is Agile and what is not is not an obvious undertaking*" [47, p.245].

Agility has several movements, mostly pre-existing the manifesto (and originating from future members of the Agile alliance), such as Adaptative Software Development (ASD), Crystal, Dynamic Systems Development

Method (DSDM), Extreme Programming (XP), Feature-Driven Development (FDD), Pragmatic Programming, and Scrum. Lean is also often associated with Agile but there is a nuance. "*Lean focuses on doing more with less, to be efficient, while being 'agile' includes that the organization is able to respond rapidly to changes in demand*" [3, p.178]. In other words, Lean may be considered as an element of Agile, but it does not incorporate the whole Agile philosohpy.

"*Among the Agile approaches, Scrum and Scrum/XP Hybrid (64%) continue to be the most common Agile methodologies used*" [36, p.718]. However, as Agility promotes flexibility, the most mature companies in terms of Agile "*develop their own Agile-approach (own processes based on a combination of Scrum, Kanban, etc.). A proprietary approach in IT companies correlates noticeably with their maturity*" [36, p.721].

1.4   Agile benefits

Since Agile is not the only way to conduct a project, it is interesting to identify the reasons that motivate organizations to adhere to it. We have chosen to extract from our literature review a single paragraph that summarizes the benefits of using an Agile approach. This can be corroborated with a series of quotations from other authors that can be found in the appendices.

"*Compared with traditional management approaches, agile offers a number of major benefits, all of which have been studied and documented. It increases team productivity and employee satisfaction. It minimizes the waste inherent in redundant meetings, repetitive planning, excessive documentation, quality defects, and low-value product features. By improving visibility and continually adapting to customers' changing priorities, agile improves customer engagement and satisfaction, brings the most valuable products and features to market faster and more predictably, and reduces risk. By engaging team members from multiple disciplines as collaborative peers, it broadens organizational experience and builds mutual trust and respect. Finally, by dramatically reducing the time squandered on micromanaging functional projects, it allows senior managers to devote themselves more fully to higher-value work that only they can do: creating and adjusting the corporate vision; prioritizing strategic initiatives; simplifying and focusing work; assigning the right people to tasks; increasing cross-functional collaboration; and removing impediments to progress* [49].

The Agile manifesto does not, however, give any indication as to why or under what circumstances an Agile approach is successful [26, p.1103].

Chapter 2

Research gap and methodology

Considering that Agile seems to be quite popular in organizations, could it be used for other purposes than developing software?

Our research is a continuation of the study by Oprins *et al.* which concludes with this sentence: "*As organisations are inspired to implement Agile methods, we would like to invite researchers and change agents to actively apply Agile project management to new domains through action research and experiments, thus breaking down barriers to the future global expansion of Agile methods and techniques*" [47, p.257]. In our job, we had to develop a project aimed at finding ways to implement priorities decided by top management. Rather than applying a plan-driven approach, we acted as a change agent by considering an Agile approach.

We conducted a systematic literature review to gain an "*understanding of where that body of knowledge currently stands*" [48, p.39]. "*The aim is to construct a general vision of a specific question and give it a fair summary of the literature*" [40, p.2]. This question targets Agile usage in domains other than IT.

Such a review is not improvised and respects a methodological process. Firstly, it must be taken into account that there is not only one way to review a domain. The "systematic" approach "*permits a rigorous methodological analysis with lower bias than the traditional reviews*" [40, p.2]. But there are other types of review, namely the systematic mapping study and the tertiary review.

The systematic mapping study cannot be applied in our context. "*If, during the initial examination of a domain prior to commissioning a systematic review, it is discovered that very little evidence is likely to exist or that the topic is very broad then a systematic mapping study may be a more appropriate exercise than a systematic review*" [35, p.3-4]. In our case, it was clear that Agile was used in other contexts than software development,

but there was too little literature available to develop statistics.

The tertiary review cannot be applied either as it "*is dependent on sufficient systematic reviews of a high quality being available*" [35, p.3]. The idea is to conduct a systematic review of systematic reviews. There is not enough data currently available to do this.

In order to develop our research question [46, p.2], our systematic literature review had to consider the following five criteria [35, p.11-12]:

- Population: anyone involved in a project outside of IT.

- Intervention: the Agile approach.

- Comparison: the non Agile approach.

- Outcomes: assessing the benefits of using an Agile approach.

- Context: any context (academia, industry, government,...).

The results of this review enabled us to formulate our research question thusly: *Can we approach an administrative project in an Agile way?* That leads us to these sub-questions:

1. Which projects other than software engineering have already adopted an Agile approach?

2. How can we apply Agile to an administrative project?

To establish the state of the art in the field, we need to target the literature concerning the use of Agile outside IT or software development, as Agile is essentially used in software engineering. Although the research question focuses on administrative projects, this theme is too narrow. So we extended it a little bit by including the use of Agile outside of computing science. We considered the following main keywords: "agile", "non IT", "non software". More precisely, the generic search string was: *"agile" AND ("non IT" OR "non ICT" OR "non software")*. It was necessary to see a clear distinction from the typical application of the Agile approach in the IT field (mainly software engineering) therefore, a query negating the terms "software", "IT" or "ICT" (via the minus operator) would not have been relevant. On the contrary, they had to appear to let the author specify a different use. We observed during our preliminary research that this formulation was regularly used (*e.g.* "applying Agile to non... context").

The query was executed on October 2020 using the following search engines:

- IEEE Xplore (*"All Metadata":"agile" AND ("All Metadata":"non it" OR "All Metadata":"non ict" OR "All Metadata":"non software"*) yielded 8 results.

- Springer (*"agile" AND ("non it" OR "non ict" OR "non software")*) yielded 382 results.

- ACM (*"agile" AND ("non it" OR "non ict" OR "non software")*) yielded 105 results.

- Wiley (*"agile" AND ("non it" OR "non ict" OR "non software")*) yielded 122 results.

The results were compiled and the following criteria applied: the papers must be written in English and duplicate references removed. This preliminary selection left almost 500 references. As it was unrealistic to read each paper completely, a more subjective step was taken to determine if the content was relevant to the research question [46, p.5-6]. For each paper, we read in order: the title, the abstract, the introduction, and the conclusion to ascertain whether it should be considered in this review or not. For example, if the title alone was sufficiently convincing, the abstract, introduction and conclusion did not need to be read. In case of doubt, the abstract was read, and so on. A supplementary criterion was of course that the paper must be accessible to be read by us. In retrospect, there were very few papers that were not available through the available academic resources.

Some references were then added when a paper was found to be relevant to the research question and its bibliography provided further potential research material. These references were then subjected to the same selection method as described earlier (reading the title, then potentially the abstract, then potentially the introduction, then potentially the conclusion).

Finally, 24 papers were found that met the criteria in the first round, then 20 more by "rebound" (from the bibliography of the 24 papers). These 44 papers form the basis of our research and are listed in the bibliography with the mention "[SLR]" meaning "Systematic Literature Review".

The 44 papers contributed to the various chapters of this thesis in the following proportions: 8 for chapter 1, 1 for chapter 2, 39 for chapter 3, 13 for chapter 4 and 5 for chapter 5. The same paper may have been referenced in several chapters, as shown in table 2.1. Based on the year of publication, most papers are later than 2015 although there was no date filtering in our criteria: 4 in 2020, 8 in 2019, 5 in 2018, 4 in 2017, 6 in 2016. For the rest, 12 papers were published between 2011 and 2015, 3 between 2006 and 2010, 2 before 2006.

Author(s)	Year	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5
Ackles [1]	2018			x		
Aronsson *et al.* [3]	2011	x		x		
Barroca *et al.* [4]	2019			x		
Benton *et al.* [6]	2011			x		
Berger *et al.* [7]	2015				x	

Bergmann *et al.* [8]	2018			x		
Ciric *et al.* [11]	2017			x		
Ciupe *et al.* [12]	2017			x		
Conboy *et al.* [13]	2004			x		x
Conforto *et al.* [14]	2014	x		x	x	
Confrey *et al.* [15]	2018			x		
Cooper *et al.* [16]	2016			x	x	
Cooper *et al.* [17]	2018			x	x	
Debois [19]	2008			x	x	
Dumrak *et al.* [21]	2020			x	x	
Fronza *et al.* [22]	2017			x		
Gerber *et al.* [24]	2019			x		
Goevert *et al.* [25]	2019			x		
Gonzales [26]	2020	x			x	
Gustavsson [27]	2016			x		
Hazzan *et al.* [28]	2008			x		
Houston *et al.* [29]	2016	x		x		x
Hulshult *et al.* [30]	2019			x		
Hunt *et al.* [31]	2013			x		
Karvonen *et al.* [33]	2018			x	x	x
Kettunen *et al.* [34]	2019			x		
Kovaleva [36]	2020	x		x	x	
Krehbiel *et al.* [37]	2017			x	x	
Kropp *et al.* [38]	2016			x		
Lankhorst *et al.* [39]	2012			x		
Mazzanti [41]	2012			x		
Meyer [42]	2014					x
Milani *et al.* [43]	2020				x	
Mirza *et al.* [44]	2019			x		
Oprins *et al.* [47]	2019	x	x	x		
Rigby *et al.* [50]	2016	x		x	x	
Soderqvist *et al.* [56]	2019			x		
Stare [53]	2013				x	
Steenberg [54]	2016			x		
Sutherland *et al.* [55]	2009			x		
Takeuchi *et al.* [57]	1986			x		x
Torrecilla-Salinas [58]	2014			x		
Van Sollingen *et al.* [59]	2011			x		
Willeke [60]	2011	x		x		

Table 2.1: Systematic literature review papers usage

Chapter 3

Agile outside software development

As written by one of the signatories of the Agile manifesto, "*Agile has indisputably transformed software development, and many experts believe it is now poised to expand far beyond IT. Ironically, that's where it began — outside of IT*" [50].

"*In general, agility is not specific to software development, and Agile enterprises have been considered much before the Agile Manifesto in 2001 – particularly in manufacturing industries*" [34, p.385]. Even the term "Agile" itself is not a concept unique to software development [13, p.38], as it appeared in a report prepared for the U.S. Office of Naval Research in 1992: "*The existing industrial era dominated by mass production manufacturing is drawing to a close. It is giving way to a new era, to be dominated by agile manufacturing enterprises*" [45, p.ii].

It is probable that the roots of Agile thinking (that later led to the creation of the Agile manifesto) came from large manufacturing enterprises looking to improve their innovation, flexibility and speed [57].

Even the sport analogy illustrated in the Scrum vocabulary was evoked in 1986 (nearly ten years before the paper presenting the Scrum development process) [51]: "*Under the rugby approach, the product development process emerges from the constant interaction of a hand-picked, multidisciplinary team whose members work together from start to finish. Rather than moving in defined, highly structured stages, the process is born out of the team members' interplay*" [57]. This analogy was compared to the "relay race" approach that illustrated the traditional sequential way of managing a project, from phase to phase, "*with one group of functional specialists passing the baton to the next group*" [57].

An obvious question to ask is simply "why"? What does a team expect from using Agile outside of software engineering? "*The most commonly mentioned reasons given by participants to adopt Agile ways of working in*

their teams were: (1) external threats and fluctuating customer needs; (2) a lack of transparency about the value that was being delivered and how it connected to other organisational units; (3) the realisation that previously applied project management approaches did not work; and (4) the quest for increased employee satisfaction" [47, p.250]. Although there is also a phenomenon of mimicry between teams as *"companies and departments were often inspired by the success of Scrum in IT environments"* [47, p.257].

Agile practices are used in multiple sectors, both commercial and governmental. But *"unfortunately the focus is often on practices and on the mechanics, ignoring the values and principles that drive those practices"* [41, p.197]. This means that using a kanban board, for example, is not sufficient to qualify the work process as Agile.

The Agile *"methodologies can also be considered to be a framework to plan, estimate and manage any kind of project focused on quick-response, adaptation to customers' needs and early delivery of value to customers"* [58, p.459]. *"The application of agile was proposed in different domains, but in almost all cases it is based on the iterative nature of projects or some particular phases which would benefit from more flexible approach in responding to changing requirements"* [11, p.336].

Among the different Agile movements, Scrum is generally considered to be the most popular [36, p.718]. Moreover, Scrum implements agility in a generic way and is therefore more easily applicable in a field other than software development. This is why we will often find a Scrum base on which to apply the Agile philosophy outside of software engineering [59, p.288]. *"Scrum is an agile method, which supports project management and is not as much IT specific than other methods. Hence, it is the most transferred agile method"* [25, p.120]. But Scrum is not a panacea and might not work for everyone, especially those who are too individualistic [55, p.354].

The following sections present areas other than software development where Agile has been used.

3.1 IT infrastructure

3.1.1 Datacenter migration

An Agile experiment concerning datacenter migration was made. A new datacenter had to be constructed to replace the "future" old one. But *"as usual in large enterprises, development, infrastructure and operations were separate groups"* [19, p.202]. The architects who were assigned to formulate the requirements of the new datacenter focused on the design and the latest improvements. *"They would only release their datacenter to new applications after every system or process was completely detailed"* [19, p.202]. This task took more time than foreseen, causing the new projects te be delayed. The president became nervous and decided that something had to be put in

place even if it was not finished and they can continue to improve things afterwards.

A small task force was set up to get things going. They chose to use Scrum as a project methodology because it was a good fit with the president's wish. Unlike the architects, the task force contacted each project leader in order to get them involved in the meetings. *"Each application was seen as a customer for the datacenter"* [19, p.202]. Because of this interaction between the project leaders, they *"became aware of the shared nature of the infrastructure and better understood the problems of scheduling. Also the taskforce could point out several non-functional requirements like security, performance, logging, and monitoring that had not been taking into account"* [19, p.202-203].

Results were not immediately observed. A few implementations of deployments to the new datacenter were required. After the third implementation, fewer integration problems were observed. *"The application went live and even during production this improvement process continued. Every release they would improve both the software and the infrastructure"* [19, p.203].

3.1.2 Spanish regional ministry of culture and sport

The ICT department of the Regional Ministry of Culture and Sport of Andalousia saw a dramatic increase in the number of systems under its responsibility. This was mainly due to different initiatives launched in previous years to address citizens' demands for quick and easy access to public services. The department was also asked to increase their efforts on costs rationalization and optimization.

Therefore, they started with *"a project to improve internal infrastructure and provide a better service with fewer resources"* [58, p.463]. A team was set up with members from two different offices of the ICT department: system management and e-government. The roles of scrum master, product owner and development team were shared amongst five members (although of course the "development" aspect was not about software engineering in this case). The usual Scrum artifacts, tools and practices were used (product backlog, user stories, sprint-based cycle, burndown chart, retrospective,...). The project lasted more than a year through 11 sprints.

Techniques were used *"to support the estimating, planning and managing efforts, as continuous processes along the project and not as an initial phase"* [58, p.470] such as earned value management and productivity metrics. Finally, the project assessed *"the feasibility of using Agile approaches in IT projects unrelated to software development, with a special focus on the project management aspects"* [58, p.460].

3.2 Manufacturing

In this section, a series of examples will present the use of Agile approaches in the context of activities aimed at building objects. The title does not reflect only large manufacturing or industrial companies.

3.2.1 Bathtubs

The Italian company Teuco Guzzini (bathtub and shower manufacturers) changed its business model in 2009 by outsourcing some of its processes. However, this created a series of problems such as increased time to market and a diminution of product quality. "*Most of the blame for this was attributed to engineers being untrustworthy and ineffective, especially in managing external partners*" [41, p.197].

An assessment of the situation was led by an external consultant. The key problems were found to be: overburden, too much multitasking, continuous changes in priorities or in specifications, delays in approvals, and production costs that were higher than expected [41, p.199]. The consultant then introduced a transition using an Agile and Lean approach. The goal of this approach was to: visualize all ongoing activities throughout the production process, expose and measure dysfunctions, analyze data and decide what to do [41, p.199]. Typical Agile practices were introduced : kanban, standup, retrospective,... During the first sessions, a major difference became apparent between the product engineers and the software developers participating in the meetings: the "*product engineers were feeling and acting as individuals. They didn't feel they were part of a team. They had their own independent goals and were focused just on them*" [41, p.200]. [...]. The use of standups and retrospectives helped address this problem and provided a gluing factor for the team.

At the time of writing the paper, the Agile transition was still ongoing and some improvements had already been achieved such as a significant reduction in the engineers' excessive workload (through demand management and capacity leveling) [41, p.202]. "*This in turn [...] led to better predictability for Small and Medium projects both in term of schedule and quality*" [41, p.202].

Another observed benefit was the improved motivation of engineers, measured with the number of "bad days" tracked using a niko-niko calendar.

Seeing the results, other departments asked to have their work processes reworked in an Agile mode as well.

According to the author (who is rather accustomed to software development), the fact that Agile was used in an non-software domain was not a major issue as both uses focused on value creation. Some typical code-oriented practices were simply not used [41, p.203].

3.2.2 Cars

Car manufacturing involves many players. Agile implementations usually require a small team in order to encourage self-organization. When "the team" involves several dozen individuals, we use the term "large-scale Agile".

The Mechanical Architecture and Integration (MAI) department at Volvo Cars employs about 100 mechanical integration engineers (MIE). They have to ensure the proper integration of the digital representation of hardware (*e.g.* electronic component, door, body) of a virtual car during the product development process. Each car project involves several hundred developers. This ensures the consistency of the product across all its subsystems in order to avoid or resolve conflicts. MAI "*employs collaborative methods to seek solutions, encourages exploration and creativity and allows design and implementation to be inseparable in the work process. In other words, much of what characterizes fertile ground for agile work practices*" [56, p.69].

Considering the number of persons involved, one MIE is responsible for monitoring the integration within a specific chunk of the car project (for example, the rear). The purpose is to identify the "*present and potential integration issues among sub-systems involved in the 'chunk' that are under development by different work groups in the project*" [56, p.69]. The MIE has an overall perspective on the product and is able to identify the people who could contribute to solving a potential issue. But he/she has no formal authority and acts as a facilitator for inter-team coordination.

The author of this ethnographic research notes that this manner of managing inter-team coordination is based on informal and pragmatic practices. This leads him to believe that "*the informal practices ongoing in formally plan-driven hardware development may constitute an untapped resource in agile transformation efforts*" [56, p.70]. This would mean that a transition to an Agile mode of operation would be facilitated by taking into account existing practices. This seems to make sense, as highlighting practices already in place might reduce the inherent barriers/resistance to change.

3.2.3 Medical products

A seven-member medical research team in Germany looked at developing a 3D-printed microtiter plate using Agile approaches, Scrum in particular. In the medical field, strict regulations on procedures and documentation cannot be ignored. Therefore, an adaptation was necessary to make an Agile approach fit these constraints, as it usually tries to free itself from them [24, p.824]. More so, as "*the documentation requirements are not limited to the finished product, they also include the development and production process*" [24, p.825].

The team was regularly surveyed during the six month long project. At

the beginning, rapid prototyping led to optimistic perspectives about the product development. However, development stalled as the documentation requirement monopolized the team's resources. There were therefore fewer new and motivating results [24, p.829].

Agile needed to be used for several sprints before it became profitable. A conclusion was: *"Agile methods accelerate the team development process at the beginning, but the additional effort due to the new process rules is most profitable after about 3 sprints. Afterwards the well-rehearsed team can benefit from the known scrum standards and developed practices"* [24, p.830].

For Agile projects in the medical domain, the authors proposed to divide the process into three phases [24, p.831-832] which are illustrated in figure 3.1:

1. Orientation via research, interviews, joint workshops,... before the actual development to allow consensus about goals, vision, technical knowledge, a common picture of the end-user, and an understanding of Agile methods.

2. An overall implementation which mainly consists of following the sprint structure of Scrum.

3. A final securing-phase to focus on fulfilling the vision and preparing the final presentation/documentation.

3.2.4   Various industries

Discreet enablers

Nineteen medium-sized Brazilian companies were surveyed as *"a preliminary research effort to identify practices and enablers together in non-software, but innovative, project environments"* [14, p.22]. They belonged to different industrial sectors: mining, steel and metallurgical industries, the auto industry, energy, engineering projects, consumer goods, electronics, telecommunications. An enabler is considered as a factor that could contribute to an Agile project management approach (*e.g.* practice, technique, tool) [14, p.21]. Although the surveyed companies did not formally recognize the use of Agile methods [14, p.21], the researchers found evidence of favorable aspects for Agile implementation such as: the project team size, the product development process formalization level, the minimal textual description of the project scope, the collaboratively created project plan with shared responsability, the weekly basis updated plan [14, p.30].
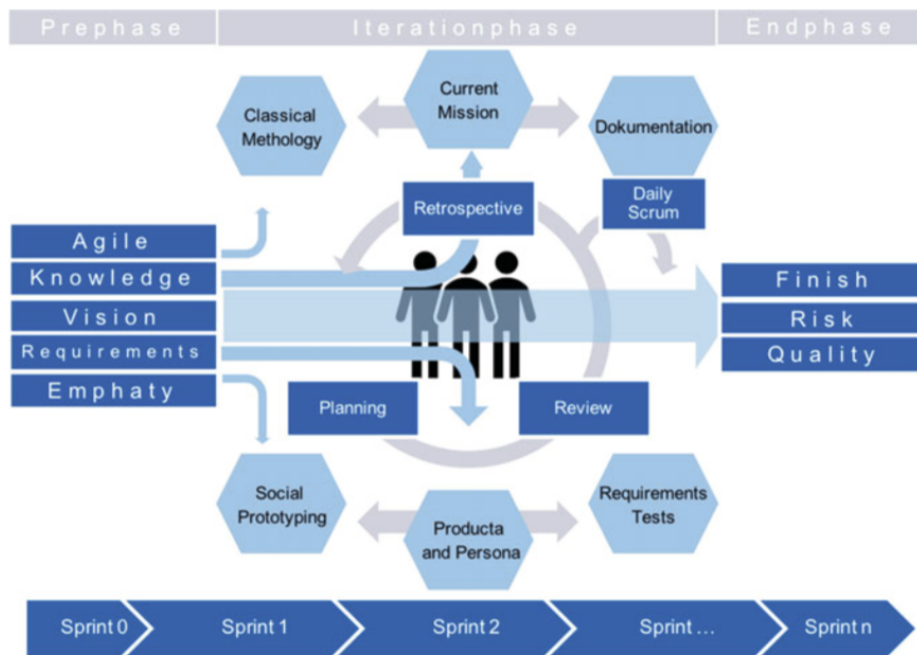
Figure 3.1: Recommendations of an Agile process for medical product development (Gerber *et al.*, 2019)

Agile-Stage-Gate model

Manufacturing firms widely adopted a Stage-Gate method to drive new-product projects. This model "*describes a system in which the product development process - from the idea generation to market launch - is broken into discrete stages, each with defined tasks and prescribed deliverables [...]. Gates that precede each stage mark Go/Kill or investment decision points*" [17, p.18]. But "*gating systems are simply too linear and too rigid to adapt effectively to the unstable and rapidly changing markets and customer needs that drive today's new products*" [17, p.18]. Therefore, a hybrid model was developed. Named "Agile-Stage-Gate", it is illustrated in figure 3.2 and combines the Stage-Gate elements (focus, structure, control) with the Agile ones (speed, flexibility, productivity) [17, p.17].

Six firms were surveyed about their implementation of this model: Honeywell, LEGO group, Tetra Pak, GE, Chamberlain, Danfoss. These enterprises were working with Agile-Stage-Gate models for at least two years [17, p.20]. The aggregated description of the model is as following: "*Each stage is composed of a series of time-boxed sprints, each lasting about two to four weeks. As in pure Agile, each sprint is planned in real time, on the fly, yielding a process that is highly responsive and adaptative. At the end of each sprint, the project team produces a tangible result of some kind - a prototype*
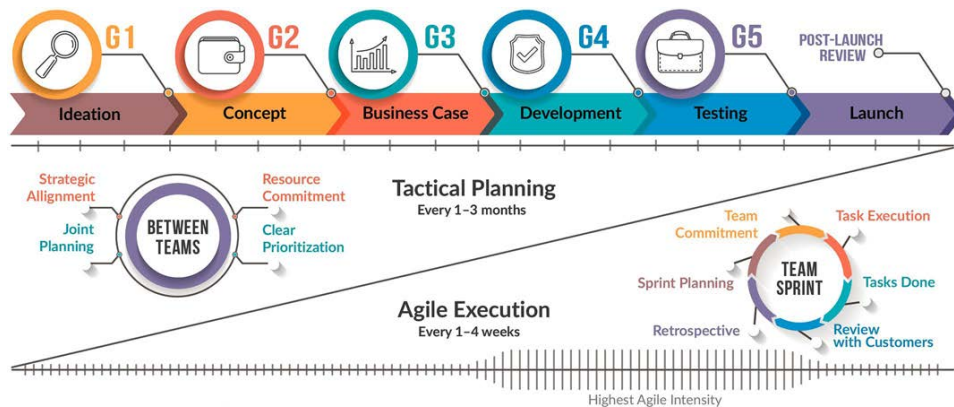
Figure 3.2: Typical Agile-Stage-Gate hybrid model, with Agile sprint built into stages (Cooper *et al.*, 2018)

or other physical model that can be demonstrated to stakeholders, including customers, for validation and to identify needed design changes. Many firms also conduct a tactical planning every one to three months across all development teams and with management. Here, teams meet to create a joint tactical plan, prioritize activities, and allocate limited resources for the next period" [17, p.19].

Nine Scrum elements were observed to be relevant to the Agile-Stage-Gate model: three roles (product owner, scrum master, development team), three artefacts (time-boxed sprint, daily scrum, retrospective meeting) and three tools (backlog, scrum board, burndown chart) [16, p.6].

3.3 Education

Quite naturally, many experiments with the Agile approach in educational contexts took place in the field of software development or more generally in classes dedicated to IT [12]. One of the objectives was to help students experience the type of approach they would find in companies after graduation [38]. Agile was also experimented in several non IT classes and also for reviewing educational organisation processes.

3.3.1 Online courses

The online education department of the Ohio Christian university introduced the Agile approach to make the curriculum design for courses offered to adult learners more efficient. Seeing that it was working well, other departments were also interested [60, p.246]. In fact the Agile shift was gradual even in the online education department. There was no "Agile awakening" in the head of its director : *"I had little caring about the agile philosophy*

and was looking for a tool that would be inexpensive for my team to coordinate across several states and have real time updates. The discovery of an online personal kanban board was the simple and obvious resolution" [60, p.247]. The combination of their personal kanban boards into one view improved productivity as each member could see each other's progress. They were also able to see how individual tasks contributed to the collective goal. Each individual was not isolated but really contributed to the team effort.

The Scrum framework was introduced later and aligned to instructional design, resulting in a simpler curriculum design process with four stages, each one experiencing generally a two-week Scrum iteration:

1. Framework. The course objectives were developed, as well as the course description, the resources and the weekly objectives.

2. Fulfillment. The method for fulfilling the weekly objectives was developed, taking care to explain the relevance of the activity.

3. Completion. A curriculum template was developed with all the required details.

4. Support. This step was a kind of review and editorial pass.

This resulted in the reduction of a months-long process to an eight to ten week process. Another benefit of using Agile is that at any point, the course could be offered [60, p.248], for example, if the expert in charge (often an external supplier) abandoned the project, the stages currently completed could be transferred to another expert.

The Scrum terminology was not shared with the team, allowing them *"to get a sense of cohesiveness first without the stress of asking "are we doing this right?" Instead the question was "does this work for us?" The strong focus on conceptual approaches allowed for a better adaptation, with a subsequent understanding of the terminology and how it maps to our needs"* [60, p.250].

Finally, the main benefits of applying Agile were:

- The supplier satisfaction. The expert could focus on the content instead of fitting it to logistics and expectations. Also the expert benefitted from a better quality feedback. Finally, the much simpler process reduced the number of questions.

- Time savings. The finished product was completed in two months instead of more.

- Better internal communication. The shared kanban board saved several hours of reporting, emailing, phone calling,...

3.3.2 Module production process

A large (9000 employees) and distributed educational organisation launched a new strategy that had as one of its objectives, a focus on operational efficiency [33, p.139]. A key goal was in particular cost reduction associated with its module production process (*i.e.* the design and development of curriculum elements such as text, videos, books,...), which involves multiple organisational units and stakeholders from academic faculties to media production functions [33, p.138]. Hence, the enterprise was mainly focused "*on internal operational agility improvement (e.g. 'doing the thing right') rather than strategic orientation towards sensing and seizing new business opportunities and/or threats (e.g. 'doing the right thing')*" [33, p.139].

Thirty-seven volunteers divided into five teams were set to explore how Agile could be applied, each one working on a specific topic: AgilePM, Scrumban, Kanban, Agile principles and values, Agile teams and organisation. The activities of these teams were called "Agile discovery sprints" because the participants were empowered to think about how they worked and what aspects were the most interesting for making the organisation more Agile [33, p.138]. A holistic transformation would include business, operations and cultural aspects. [33, p.132].

Based on the Competing Values Framework (CVF) [10] (which describes the organisational culture type), Agile is typically associated with the "Adhocracy" culture (*i.e.* oriented toward flexibility and discretion on the one hand, and external focus and differentiation on the other) while the case organisation operated in a hierarchical culture [33, p.136].

The CVF classifies organisational cultures along two axes, which leads to four culture types as illustrated in figure 3.3 [32]. Within these culture types we find descriptions of orientation, leader type, values, and effectiveness.

3.3.3 Feature Driven Scrum

The university of Houston-Clear Lake set up a study group comprised of eight software engineering students where the goal was to learn functional programming. This group was asked to use a "Feature Driven Scrum" approach, which combines "Feature Driven Development" [44, p.110]. The meetings were conducted online as "*the participants interested in joining the study group were from various regions and some of the students were part-time master's students*" [44, p.112].

Based on the five steps involved in the "Feature Driven Development" approach, the "Scrum" oriented methodology involved the following phases [44, p.112]:

1. Development of an overall draft. The participants developed a high-level walkthrough of the plan. The use of brainstorming was encouraged. This step emphasized communication between individuals.
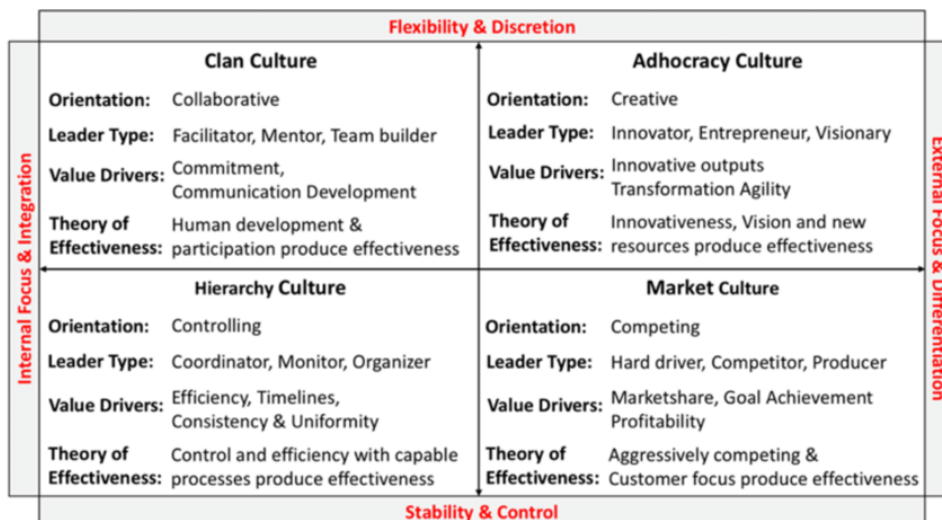
Figure 3.3: Competing Values framework (Cameron *et al.*, 2011) summarized by Hutchison *et al.* (2019)

2. Planning meetings. The participants met to decide what their goals were for the next sprint and how to split it into daily goals. This encouraged communication between them and taught them the concept of sprints.

3. Daily Scrum meetings. Each participant shared her/his progress with the entire group. They could also share their concerns with other team members. This step revealed how progress is measured through work done.

4. Sprint review meetings. The participants reflect back to see if they have achieved their goals. If not, they were considered as backlogs. The backlogs from the previous sprint were also taken into consideration while deciding the goals. This step teaches the concept of backlogs and sprint dynamics.

5. End of study retrospective. The participants discussed what they learned from the entire process and how they could improve on it in the future.

3.3.4   Online Agile practices

Even before the COVID-19 pandemic, the United States observed that distance education enrollments increased each year [30, p.56]. "*A major concern for online courses is the level of interaction needed to facilitate collaboration and meaningful, shared discourse in an online environment*" [30,

p.57]. *"In traditional face-to-face classrooms, student and instructor interaction naturally occurs with conversation and discussion. In an online environment, the instructor needs to foster, encourage, and support interaction"* [30, p.58].

Therefore, an experiment was conducted in an online semester-long "systems design and lifecycle" undergraduate course at Miami university [30, p.63]. The twenty-one students were divided into five groups. Each team *"was required to develop a solution to a hypothetical scenario and then use project management practices to manage the development of their solution"* [30, p.63]. Eight Agile practices were implemented: team charters, daily stand-ups, kanban boards, story cards, MoSCoW, timeboxing, showcases, and retrospectives.

At the end of the experiment, the students were surveyed about the use of these Agile practices in the course. A first set of general questions about Agile was answered by 16 students. Their responses gave a mean of more than 4 on a scale of 5, indicating that globally, they found great value in using Agile practices (more effective learning experience, more efficient use of their time, better work together, higher quality deliverables, beneficial experience) [30, p.64].

A second set of questions focused on each of the eight practices used. These were answered by 12 students. Although globally the average rating was close to 4 (sometimes a bit more, sometimes a bit less) on a scale of 5 for all the practices, they could be sorted by order of preference: MoSCoW, retrospective and timeboxing, kanban boards and team charters, story cards and showcases, daily stand-ups [30, p.64].

The authors of the experiment recommended to start small and implement one Agile practice at a time (*e.g.* one per iteration). Agile is a process of continuous refinements. Each practice could work differently in different courses. If a practice does not seem to work well, it is useful to bring it up in the retrospective phrase [30, p.65].

3.3.5 Manifesto for teaching and learning

Six colleges at a public university formed a learning community to determine whether Agile (concepts, practices and benefits) was applicable to higher education settings. *"After more than two years of study, experimentation, and reflection, this group found that its adaptations of Agile to higher education produced positive outcomes by increasing student engagement, encouraging students to take responsibility for their learning, enhancing the level and quality of collaboration, and producing higher quality deliverables"* [37, p.90].

They used Agile tools and an Agile mindset within an array of different disciplines such as computer science, software engineering, and information systems but also supply chain management, English, teacher education, civic

studies, and political science. Moreover, they did not only focus on applying the Agile approach in the curricula but also on trying to incorporate the "Agile mindset" in their own role inside their faculty. They ended up formulating their own "Manifesto for teaching and learning":

- Adaptability over prescriptive teaching methods

- Collaboration over individual accomplishment

- Achievement of learning outcomes over student testing and assessment

- Student-driven inquiry over classroom lecturing

- Demonstration and application over accumulation of information

- Continuous improvement over the maintenance of current practices

A survey was conducted with the 109 students enrolled in the Agile-infused courses. The mean ranged from 3,7 to 4,0 on a scale of 5 for questions concerning their perception of Agile outcomes (realistic context, effective learning experience, efficient use of time, teamwork, deliverable quality, overall learning experience) [37, p.106].

Concerning the student perception of Agile techniques, the mean ranged from 3,8 to 4,2 on a scale of 5 (retrospective, planning meeting, daily stand-up, project charter, scrum master) [37, p.106].

3.3.6 Computational thinking in middle school

An Italian middle school elaborated and put in action a framework inspired by Agile for teaching and assessing computational thinking (CT) in two 6th-grade classes (12 years old, *a.k.a.* K-12). The framework covered 60 hours and involved 42 participants in total (two classes). The computer science program for these K-12 students was composed of three elements: computational thinking (ability to apply computational techniques in every field), computer literacy (ability to use basic computer applications) and computer fluency (high-level understanding of how a computer system works) [22, p.2].

The framework has two parts. First, 20 hours to introduce the needed computational concepts through a targeted set of exercises without using a computer. For example, "*a student stands up and plays the role of a cat that needs to move to the point in the classroom where a key is located and then say, 'I found my key'*" [22, p.8]. The students had to brainstorm, identify the problem, find a high-level solution, and then refine to put it in action in the smallest details. Each exercise aims a programming-specific problem.

The second part of the framework lasted 40 hours and had as a goal the creation of an animation. The process mimicked an Agile way of working,

as illustrated in figure 7.2 in the appendices: working per iteration, different roles in the team, deliverables,...

This experiment enabled the collection of "*evidence on the assimilation and exercising of CT skills by observing how the sixth-grade students with little or no background in software development were able to design and implement a working software application*" [22, p.25].

3.3.7 Teaching mathematics

Teachers in a middle school mathematics class used a digital learning system (DLS) containing curricular resources for the students. The teachers were encouraged to customize the offerings, yet maintain curricular coherence. An Agile curriculum was therefore developed "*as a means to support the ongoing revision and adaptation of teachers' curricular practices based on providing immediate data about what one's students are learning*" [15, p.158]. Analogously to the Agile approach, the needs of the students needed to be rapidly and flexibly addressed to improve their learning experience.

The Agile curriculum was composed of two types of feedback cycles. The short cycle (illustration 3.4) operated during a curricular unit. The long cycle feedback (illustration 3.5) "*involves retrospective evidence-based deliberations toward revisions of materials and/or sequencing and operates across months and years*" [15, p.161].
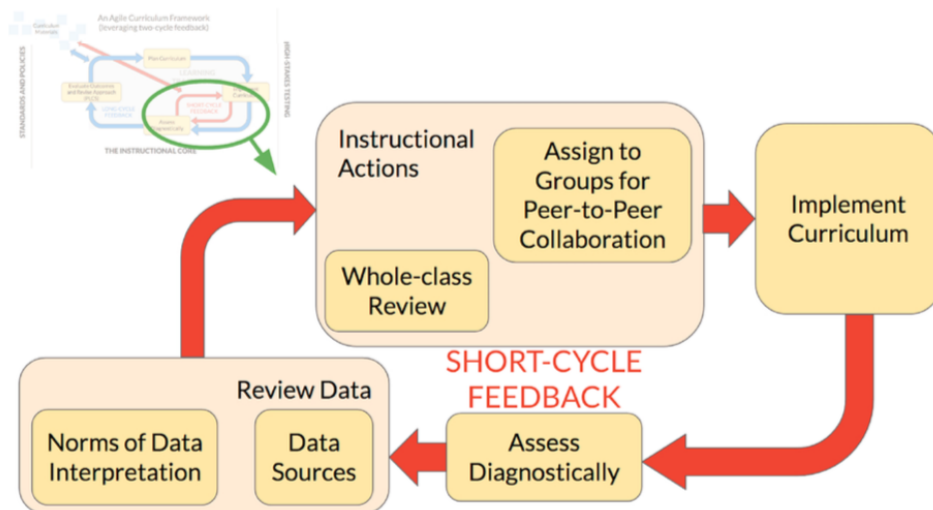

Figure 3.4: The short-cycle feedback loop from the Agile curriculum framework (Confrey *et al.*, 2018)

The Agile curriculum was based on four principles melding key features of curricular enactment and classroom assessment [15, p.161]:
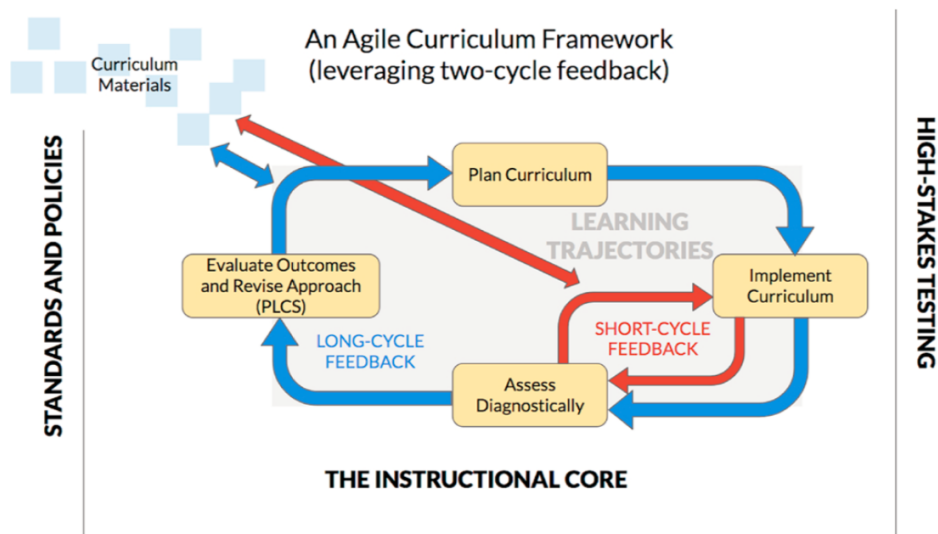
Figure 3.5: The Agile curriculum framework (Confrey *et al.*, 2018)

1. Explicit, transparent learning theory guides the interpretation of data and enactment.

2. Instructional adjustments and supplementation occur in response to short-cycle feedback during enactment.

3. Students are recruited as partners in interpreting and acting on assessment data.

4. Teachers' roles in instrumental orchestration are strengthened: they become increasingly skilled in conducting student-centered instruction while leveraging learning trajectory-based evidence to meet individual and group needs.

The Agile curriculum was put into action in a mathematics-oriented digital learning system called "Math-Mapper 6-8".

3.3.8 Teaching music

Ackles, a teacher at Marcellus high school, developed the "Agile Development Instructional Framework" (ADIF) in the vocal domain of musical instruction. This model was strongly inspired by Scrum. "*Through the application of ADIF, music students are provided the opportunity to expand their learning beyond the traditional performance-driven music environment and become cognizant of their individual responsibility for the subject content, the rehearsal process, and their active participation in the music education process*" [1, p.24]. A teaching shift was necessary: from a director who drove

26

the group (the student remain passive and reproduce a product as defined by the director) to a more teaching-architect or facilitator role. This new method focused on problem-based learning: *"the students define the problem, apply current knowledge, work collaboratively, and by doing so, acquire new skills through self-directed learning"* [1, p.25].

Based on the original Agile manifesto values, five Agile rehearsal values create the underlying philosophy that structures and supports the ADIF [1, p.26]:

- Teacher and student-to-student collaboration over the traditional director-led rehearsal.

- Individual choir members' interactions over performance-based music instruction.

- Students' individual musical growth over the presentation of a performance.

- Rapid, planned, short, small group sectionals (sprint) over the full ensemble rehearsals.

- Responding and adapting to change over following a specific lesson plan.

"This process starts at the beginning of the school year as the director sets up classroom behavior, requirements, expectations, and individual student responsibility to the performing ensemble" [1, p.27]. The flow is quite similar to Scrum except that the focus is put on the concepts or skills to study. The main Scrum artifacts or roles are used: sprint, burndown chart, backlog, scrum master,...

3.3.9 Epistemological concerns between Agile and pedagogy

Benton and Radziwill studied the link between two conceptual frameworks: Agile Organizing Framework (AOF) and social constructivist pedagogy.

On the one hand, the three principles of AOF are to *"1) match the coevolutionary change rate between the development team and the customer, 2) optimize self-organization, and 3) synchronize exploitation (improvements in productivity, processes, and existing products) with exploration (innovation and the creation of new knowledge)"* [6, p.131].

On the other hand, constructivism theory states that learning is an active process. *"Knowledge is not transmitted from teacher to student, but rather is reconstructed anew each time a student confronts lessons learned from experience and updates his or her world view to incorporate the new information"* [6, p.132]. Social constructivist learning extends the analysis

from the individual to the group. In this case, there would be "synergistic and emergent behaviors of groups of people learning and working in close proximity with one another" [6, p.132].

For each of the three AOF principles, two capabilities were identified and, for each of these, several enablers and inhibitors of agility as illustrated on table 3.1. The purpose was to translate the AOF "*to fit the context of instruction in higher education based on the social constructivist perspective*" [6, p.131].

Agile learning enablers	Agile learning environment inhibitors
Principle 1: Match coevolutionary change rate Agile team capability: Coevolution of students and instructor to stimulate accomplishment of learning objectives	
Driven by evolving understanding and internalization of concepts: Continuous refinement of learning objectives (*e.g.* by addressing them in daily stand-up meetings); Frequent iterative delivery of learning artifacts (*e.g.* sprints); Close, effective interaction between instructor and students (*e.g.* through paired learning, pair programming)	Instructor dictating syllabus, schedule, and assignment details, and signing off on assignments; Syllabus set in stone at the beginning of the course; Weak instructor/student relationship
Principle 1: Match coevolutionary change rate Agile team capability: Sustainable working with rhythm	
Change is embedded in and is core to the learning process: Time-pacing through short, fixed-length iterations (*e.g.* learning sprints); Regular and frequent breaks and closure; Planning using small units of time; Multilevel planning and replanning; Small granularity of assignments and teaching problem decomposition	Course pacing by planned events (*e.g.* tests); Unsustainable time-pacing; Up-front planning for the whole course and following the plan rigidly; Large granularity of assignments, deliverables, and plans (which impedes clarity and actionability); Overly restrictive or cumbersome course policies
Principle 2: Optimize self-organizing Agile team capability: Collective mindfulness	

Self-management and team discipline: Shared responsibility for course management; Team discipline through peer and self-observation	Instructor-centered course management without feedback from students; Instructor becomes bottleneck; Instructor externalized from students
Principle 2: Optimize self-organizing Agile team capability: Sharing and team learning	
Supportive structures for communication and collaboration visible to the team: Formed by interconnected practices; Fostered by open working spaces (*e.g.* through innovative classroom layout); Multi Skilling (*e.g.* through forming student teams with redundancy of skill sets)	Over-reliance on informal communication and collaboration; Tasks allocated centrally by instructor with little consultation with students; Isolated communication and collaboration depending on the willingness and attitudes of individual students
Principle 3: Synchronize exploitation and exploration Agile team capability: Process adaptation and improvement	
Reviewing and improving process regularly: Adapt learning process to learning context; Remove redundant activities and continuously monitor progress toward objectives (*e.g.* with burn down charts); Actively involve students in identifying opportunities for improvements in the learning process even for already effective practices	Learning process in the context of course management not internalized by students; Learning process is imposed by the instructor and is seen as out of touch with students; Over reliance on "common sense"
Principle 3: Synchronize exploitation and exploration Agile team capability: Product innovation	
Routinizing exploration: Formalizing extension of assignments to independently explore other aspects of the problem; Allocate class time for independent investigation	Course time not allocated for individual exploration; Focus on attendance and mechanically achieving minimum expectations; Lack of team-based exploration

Table 3.1: Translation of the AOF by Vidgen and Wang (2009) into the context of an Agile Learning Environment. (Benton and Radziwill, 2011)

Agile culture element	Starting level	Level after 5 months
Purpose and results	Thriving (4)	Transformational (5)
Agile leadership	Secure (3)	Thriving (4)
Well-being	Thriving (4)	Transformational (5)
Collaboration and autonomy	Secure (3)	Thriving (4)
Trust and transparency	Secure (3)	Thriving (4)
Adaptability to change	Secure (3)	Thriving (4)

Table 3.2: Agile culture transformation at local district council (Barroca *et al.*, 2019)

3.4 Government

From a perspective of Agile transformation of an organization's overall operations, Barroca *et al.* explored the successes and challenges faced by a local district council in the United Kingdom [4]. Their research followed a behaviour-led approach focusing on cultural orientation, known as a "sustainable agility approach" [33, p.137-138].

A series of factors that contribute to the assessment of whether an organization is Agile were taken from the literature, then used to categorize information collected from interviews and observations made during meetings that took place over a period of five months. These findings were assessed against the Agile culture development matrix [62]. This matrix normally crosses seven elements with five levels. In this case, one element was removed ("innovation and learning") because it was not covered through the interviews. The five levels are the following: surviving (1), stabilising(2), secure (3), thriving (4), transformational (5). The adapted matrix is viewable in the appendices in figure 7.1.

For each of the matrix elements, the assessment revealed a change in the Agile culture of the local district council as indicated in table 3.2.

The authors underline that challenges require a balancing act between opposing forces and "*suggest that achieving a change in culture through behaviours is not necessarily a guarantee for that change to be sustained*" [4, p.220].

3.5 Finance

A division of the venture capital group "OpenView Venture Partners" was chosen to experiment with Agile in order to implement best practices in management, sales, marketing, finance, development and customer support for their portfolio companies [55, p.350]. They wanted to improve efficiency and therefore introduced Scrum as a standard practice in their internal operations. Although OpenView was already familiar with Agile as it had

previously invested in an Agile project management tool company called VersionOne, they thought Agile was only relevant to software engineering [55, p.350].

A full Scrum approach with all its ingredients (backlog, stories, product ownership, daily scrum, retrospective,...) was adopted although it was not software oriented. Refinements occurred sprint after sprint, from "getting started" to "scaling up" phases (*e.g.* "perfect hours" instead of points to meter velocity for completing a story [55, p.351]).

The initial objective for which an Agile approach was adopted was achieved : the team was self-managing efficiently (more work completed in less hours), in particular since that every team member knew exactly what they needed to do and why at the beginning of every week. This allowed everyone to focus on execution [55, p.354]. Other benefits were observed such as the rapid integration of new members into the team and workflow. Three weeks were sufficient for them to carry a full workload without extensive training [55, p.354].

3.6 Health care

Supply chain management has been applied in numerous industries as it helps to reduce costs. "*However, the healthcare industry has been extremely slow to embrace these practices*" [3, p.176]. Therefore, Aronsson *et al.* studied how to develop a management system for the healthcare industry in a Lean and Agile way. They focused on a specific type of supply chain from 12 Swedish health care organizations of various sizes that impact "*the patient's pathway through the health care system from the first contact until the last for a specific medical problem* [3, p.177]. Considering that health care is a service industry, the patient (which is a kind of "customer") is part of the whole process until the treatment is finished [3, p.177].

"*Health care is organised in functional silos just as in industry, and has a need for well functioning processes to meet patient demands for availability of services and short lead-times as well as efficiency and quality of care*" [3, p.177]. The study was therefore based on a systems approach in which the process is at the center of the model. A process is defined as "*a chain of activities with a clear starting point and a clear end point, consisting of a number of steps, is both planned and repetitive, and has a clear goal and expected results*" [3, p.178]. A process is rarely limited to a single department and includes both operative and administrative activities. For example, the care process of patients with hip fractures involve six departments, with a need for short lead-times since the surgery should start within 24 hours [3, p.178].

"*From a patient perspective, there is a high degree of variability between different supply chains in health care*" [3, p.179]. Several criteria can be

Characteristic	Lean	Agile
Main focus	Inward; Reduce waste; Cost reduction	Customer; Quicker response; Greater flexibility; Lead-time
Strategy for handling uncertainty	Queues and buffers to protect a sub-process	Sub-processes are not protected
Planning	Fixed capacity	Flexible capacity
Traditionally used when	High volume; Predictable demand	Low volume; High variety and/or variability

Table 3.3: Characteristics of Lean and Agile strategies in a health care setting (Aronsson *et al.*, 2011)

considered:

- Duration. Hospital care can be brief or lifelong in the case of a chronic illness.

- Complexity. From one doctor's appointment to multiple care providers, departments and even social services support.

- Response time. Depending on the diagnosis, the time frames for treatment can vary (ranging from minutes to weeks).

Considering the great variability of the needs, a proposed solution consists in dividing the global care process of patients into sub-processes, each one using Agile or Lean according to its specificities. The supply chain management would be "*the overall philosophy and the glue keeping these processes together*" [3, p.182]. Table 3.3 presents the characteristics of Lean and Agile strategies in a health care setting.

3.7 Writing

Hazzan and Dubinsky, co-authors of a book about Agile in software engineering, indicated that they also used the Agile approach to drive the writing of their book [28]. The iterations were set to a timetable of two weeks, during which each author wrote a chapter. "*At the end of each iteration, after we had reviewed the chapter written by the co-author, we met for feedback and further discussions about specific topics related to the book shape, orientation, and content. After several chapters had been written, we stopped the actual writing, reviewed all the chapters we had completed, integrated them into one consistent format, and updated the future writing process*" [28, p.196-197].

3.8 Research

A workshop held at the 14th international conference on Agile software development (XP2013) explored whether Agile practices could also be used for collaboratively conducted research. "*There are many similarities between developing software and conducting academic research. Both are knowledge intensive: how to come up with a valuable idea (either a software product or a research question to be answered), how to implement the idea and how to evaluate it. Both development and academic research are also collaborative processes, involving communicating and cooperating with colleagues and peers*" [31, p.43].

The workshop (called "research dojo") lasted approximately 3 hours and gathered 7 attendees. Using different group formats (fishbowl, randori,...) at different moments:

- They discussed the similarities and differences between Agile software development and academic research.

- They elaborated a list of research topics and voted for the one to retain, namely "How to better connect industry and academia?" More precisely: "*if industry is considered the customer/consumer of research, how do you better connect the two in order to enable delivery of valuable research?*" [31, p.45].

- They clarified several research questions [31, p.46]:

  - "*How can academia learn what research industry would find useful? What? When? Why?*

  - *What examples of academic research have been useful to industry?*"

- They designed a survey to investigate the research questions using a user story format: "In order to do... I want Agile research to... so that..."

- The survey was printed out and distributed at the conference (and not further publicized). They received 7 responses.

3.9 Sales

3.9.1 Account managers

Account managers from a company called "iSense", a vendor of Scrum consulting and software projects began to implement Scrum in their own process. Scrum was already used by the software development teams but

"they decided to adopt Scrum for their sales processes to gain direct experience and improve their ability in selling it" [59, p.284].

At the beginning, they were skeptical as they considered sales much more unpredictable than software development. This experiment led to the observation that prior to the Scrum implementation, "there was no communications between account managers about goals and sales methods" [59, p.285]. Detailed information on clients were recorded by the account teams on a shared software application but the account managers seldom accessed accounts of one another's clients. The only performance indicator was the number of deals closed. The sales teams were focusing only on their daily routine and "there was no known relationship between specific tasks and final sales results" [59, p.285].

Introducing Scrum in one sales team increased transparency of sales processes and yielded a positive impact. "All other sales teams therefore adopted Scrum" [59, p.286]. Three lessons emerged from implementing Scrum in sales: identifying useful prediction indicators, understanding usefulness of transparency (impact of sales on other company divisions), and leveraging relationship maintenance and referrals with existing clients. Finally, "since the introduction of Scrum to the sales teams, the company revenue doubled. [...] At least 50% of the revenue increase should be attributed to its [Scrum] adoption" [59, p.287].

3.9.2 Sales team measures

Steenberg investigated "the significance of specific measures in determining the performance of a sales team" [54, p.4], considering the use of a Scrum methodology for constant improvement. This study of two teams over a 21-week period highlighted the importance of choosing measures in a sales environment based on Scrum. In particular, the activity based measures must be in the control of the salesperson. "Focusing purely on pipeline and growth of sales potential is not adequate and creates a set of measures that reward the incorrect behaviour of sales people. It is likely that a focus on conversion ratio is a very critical measurement in this environment and that an increased focus on higher conversion would highlight why potential customers do not want to buy and what can be done to convert these more effectively" [54, p.12].

3.10 Other sectors

In our literature review, we saw references to the use of Agile outside of the IT domain in the following sectors:

- Management, labour, marketing [13].

- Marketing, human resources, communication, geology [47].

- Services, maintenance, marketing, sales [41].

- Process improvement, supply chains, defense acquisitions, research methodology [29].

- Financial services, professional services, government, healthcare and pharmaceuticals, telecommunications, retail, transportation [44].

- Construction, real estate, managerial practice, public relations [11].

- And finally, *"National Public Radio employs agile methods to create new programming. John Deere uses them to develop new machines, and Saab to produce new fighter jets. Intronis, a leader in cloud backup services, uses them in marketing. C.H. Robinson, a global third-party logistics provider, applies them in human resources. Mission Bell Winery uses them for everything from wine production to warehousing to running its senior leadership group. And GE relies on them to speed a much-publicized transition from a 20th-century conglomerate to a 21st-century 'digital industrial company'"* [49].

However, these references provided little or no information about the implementation nor the success of Agile...

3.11   Cases summary

Table 3.4 lists the previously considered articles where Agile has been applied in a different context of software development. We attempted to categorize them according to the purpose of their research field: case story or methodological input (survey, model, analysis,...).

For the case stories, although it is quite subjective and dependant on the content of the paper, we attempted to identify which Agile values were addressed. An "x" marks some indications that this value is present. An absence of an "x" mark does not indicate automatically the absence of the value but rather the absence of indicators. Considering that the second value is labelled with software in mind, we extended it to the product or service to deliver in general.

3.12   Agile project management

Although we just saw evidence of various Agile applications in fields other than IT, some researchers try to analyse a wider definition of "Agile project management" (APM). It would be an agnostic project management taking Agile philosophy in its roots for any kind of project. The Agile counterpart to traditional project management is *"represented by the Project*

Category	Topic	Purpose	I	W	C	R
IT infrastructure	Datacenter migration [19]	Case	x	x	x	x
IT infrastructure	Spanish regional ministry of culture and sport [58]	Case	x	x	x	x
Manufacturing	Bathtub [41]	Case	x	x		x
Manufacturing	Car [56]	Case	x	x		x
Manufacturing	Medical product [24]	Case	x	x		
Manufacturing	Discreet enablers [14]	Methodology				
Manufacturing	Agile-Stage-Gate model [16] [17]	Methodology				
Education	Online courses [60]	Case	x	x	x	x
Education	Module production process [33]	Methodology				
Education	Feature Driven Scrum [44]	Methodology				
Education	Online Agile practices [30]	Methodology				
Education	Manifesto for teaching and learning [37]	Methodology				
Education	Computational thinking in middle school [22]	Methodology				
Education	Teaching mathematics [15]	Methodology				
Education	Teaching music [1]	Case	x	x		x
Education	Epistemological concerns between Agile and pedagogy [6]	Methodology				
Government	Government [4]	Methodology				
Finance	Finance [55]	Case	x	x		x
Health care	Health care [3]	Methodology				
Writing	Writing [28]	Case	x	x		x
Research	Research [31]	Case	x	x		
Sales	Account managers [59]	Case	x	x		
Sales	Sales team measures [54]	Methodology				
Agile manifesto value meaning: I = Individual and interaction over processes and tools W = Working software over comprehensive documentation C = Customer collaboration over contract negotiation R = Responding to change over following plan						

Table 3.4: Agile outside IT cases summary

Management Institute's PMBOK Guide, most elements of the IPMA Competence Baseline, as well as the ISO 10006 standard" [8, p.406]. However, the Project Management Body of Knowledge (PMBOK) 6th edition introduced "*an extension of the Agile Practice Guide to encourage the APM application in project planning and execution for non-software development environments*" [21, p.279].

It is generally accepted that Agile has proven to be useful in complex projects. "Complexity" is a widely used term lacking a clear definition. It can be characterized by a form of difficulty. "*A white paper on Mosaic Project Services defines four basic dimensions that affect the difficulty of managing projects*" [8, p.408]: size (measured regarding value), degree of technical difficulty (characteristics of the output and time needed to provide deliverables), degree of uncertainty, complexity of relationships (within the project team and surrounding the project) [8, p.408]. "*The project manager can only influence the last two factors*" [8, p.408].

APM can also be defined in terms of five key business objectives [11, p.332]:

1. Continuous innovation to deliver current customer requirements

2. Product adaptability to deliver future customer requirements

3. Reduced delivery schedules to meet market windows and improve return on investment (ROI)

4. People and process adaptability to respond rapidly to product and business change

5. Reliable results to support business growth and profitability.

"*The human factors are an integral part of the APM framework. This includes a highly knowledgeable and skilled project team, supportive top management, and deeply involved customers*" [8, p.411].

3.13   Tuning

A "strict" (although this term does not reflect Agile thinking) application of the manifesto is not possible outside of IT. "*Since the second value of the Manifesto applies only to software development, non-software development organizations are not able to live totally according to the Agile Manifesto. Also, principles 1, 3 and 7 are directly related to a software development context* [27, p.115]. Therefore it is necessary to adapt the Agile framework to the domain where it is used, as we saw in the previous examples. Despite the necessary adaptations, it is important to retain the essence of the manifesto as it seems that the first value of the Agile manifesto, namely "Individuals and interactions over processes and tools", *could have the largest*

impact on benefits in agile applications in non-software development contexts" [27, p.122]. Moreover, instead of fitting Agile into the business of the organisation, it should be the opposite. "*Ideally, the organization's way of working must be determined by the required agility, not vice versa*" [39, p.112].

Based on a survey addressed to Agile practitioners and aiming projects outside software development, "*when adopting Agile methods across different domains, the vast majority of respondents indicated that they leaned on the Scrum framework as a starting point*" [47, p.250]. Following this, some alterations might occur to adapt the approach to the context. That flexibility is of course a fundamental cornerstone of an Agile mindset. We could make an analogy with the Japanese shu-ha-ri principle which describes the steps to mastery in martial arts and especially aikido [47, p.251]. "*In the 'shu' state they study proven disciplines. Once they've mastered those, they enter the 'ha' state, where they branch out and begin to modify traditional forms. Eventually they advance to 'ri', where they have so thoroughly absorbed the laws and principles that they are free to improvise as they choose*" [49].

The Agile practices (original or customized) most commonly used across domains other than IT are: structuring work in sprints (88%), daily scrum or stand-up (88%), retrospective (88%), sprint planning (82%), sprint review (65%), backlog (47%), user stories (29%), definition of done (24%), co-located (24%), scrum master (24%), cross-functional teams (18%), empowering the team (12%), roadmapping (12%), dedicated product owner (12%), weighted shortest job first (6%), and value owners (6%) [47, p.252]. The rounded percentages are based on a total of 17 respondents.

Chapter 4

Favourable conditions for Agile

Although Agile has many qualities, it is actually not suitable for every type of project and every type of organization. A series of prerequisites must be taken into consideration to increase the likelihood that an Agile approach will be beneficial in a given environment [21, p.279].

4.1 Efficiency unnecessary

Although product quality could be higher because the client's demands are better met, the Agile approach could lead to a less efficient execution, due to the extension of deadlines and increased costs [53, p.50].

Mistakes should be tolerated because they do not endanger the outcome. *"Projects are infinitely divisible into pieces of work called modules. Each module has independent value. The cost of mistakes is below the value of the learning acquired and is affordable in different phases of the service development process"* [26, p.1105].

Inefficiency is sometimes due to a blurred vision of the costs involved, typically because the number of iterations is undetermined at the beginning. Budgeting an Agile project seems more complicated. In fact, even in a traditional project plan, the estimations are likely to change. The difference with Agile is that the likelihood of change is acknowledged and even embraced up front [17, p.22].

However, tools have been created to control costs, one of which is Slick®: *"a low-footprint, super-set of processes and metrics added to a light version of the Scrum Agile methodology"* [43, p.395-396]. At the end of each sprint, this method provides three metrics interrelated in the following formula $C = E * T$ with the following meaning for each of these metrics [43, p.397]:

C = Cost to budget The overall comparison between the predicted cost at the end of the project and the budget set at the beginning.
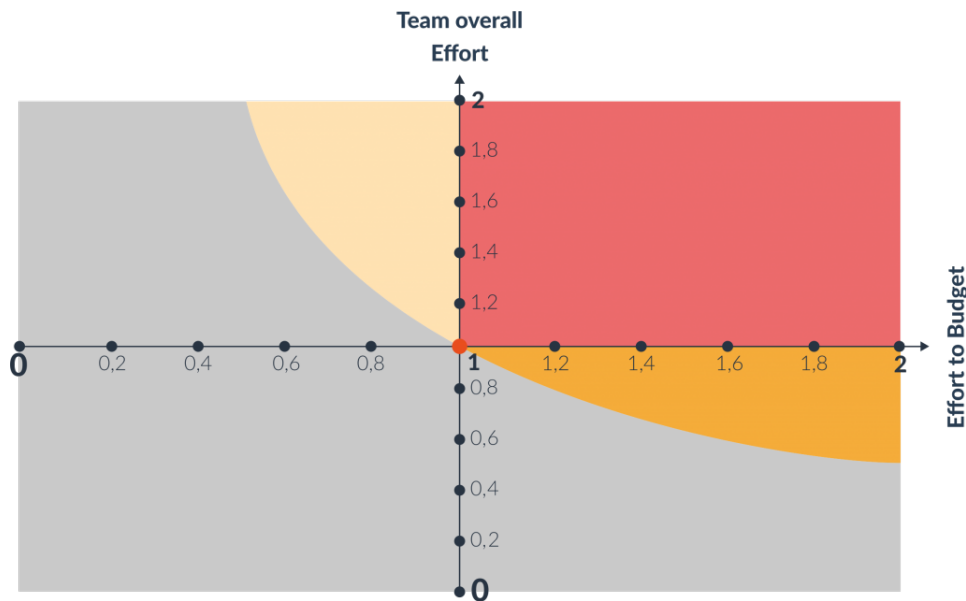
Figure 4.1: Slick® chart interrelating effort to budget and team overall effort

E = Effort to budget The comparison between the total amount of points assigned to the backlog during the scrum meetings and the budget set by the manager.

T = Team overall effort The real team effort compared to the effort expected nominally.

For each of the metrics, a value of 1 means that the project is perfectly on-track (for the respective part covered by the metric). A value greater than 1 implies difficulty while a value lower than 1 represents efficiency. The interrelation of the metrics T and E can be visualized on a four quadrants chart [63] illustrated by 4.1.

4.2 Continual change

Two prominent characteristics are neccesary: "*The constant possibility of changing the products and adding new requirements; and in particular intermediate deliverables that can be used*" [53, p.50]. In other words, Agile would not be suitable for projects involving a product that is not likely to change frequently and does not require usable deliverables. The customer preferences are usually "*not clearly stated and may change throughout the service delivery process, so product or service specifications may also change*" [26, p.1105].

Depending on the context of the project, it may seem difficult to produce an intermediate deliverable. But the team can redefine the concept of a 'done

sprint' and agree to a not necessarily working product: "*it is merely some tangible result of the work completed in that sprint*" [17, p.23]. For example, it could be a business case, the results of preliminary experiments, a voice-of-customer study, some design drawings, a computer animation, a virtual product, a pretotype, a prototype,...

4.3   Certain level of complexity

"*The problems that are addressed are complex, the concept of value is vaguely defined, and solutions are not known in advance*" [26, p.1105].

However, too much complextity can also be challenging, for example, when the final product involves artifacts or constraints from different natures (*e.g.* software, hardware, mechanics, compliance to standards and regulations, real-time functionality, strict test environment,...) [7, p.16-17].

4.4   Collaboration

For collaboration to be possible, the work must be modularizable [49]. Agile is a team approach where several people work together. Therefore, a division of labor must be made. Each team member knows which task is under his/her duty. Promoting full-time dedication and co-locating the project team would lead to more efficiency [14, p.30-31].

Collaboration is more challenging within cross-functional teams (marketing, operations, sales,...) [26, p.1106]. "*Securing 100% dedicated resources from these functions, and collocating them in the same room with the technical team members may be a bit of a challenge for many firms*" [16, p.11]. Some compromises might still be found: teams with people dedicated to the project only for a certain percentage of their time; a maximum of one project per person; a single team that works on multiple similar projects requiring similar skills; being selective about which projects use the hybrid model.

Collaboration goes beyond that of the team itself, as a close relationship with the end users (the beneficiaries of the project) is important to guide project choices. It is therefore crucial that the team can get their feedback [49]. Close collaboration and fluid dialogue should be present between the Agile team, the customers and the users [26, p.1105].

For example, establishing priorities between tasks can lead to social tension, even if the priorization criteria are well known. If the team has chosen to prioritize emerging problems, the project managers who are outside of the team may not understand why no overall progress has been made. They end up invoking exceptions or even putting social pressure on the team. One way to solve this problem is to show the project managers the complete

backlog so that they have a global perspective of the project and not just the elements that interest them directly [19, p.204].

4.5 Open mindset

The mindset of the people and the culture of the organisation seem to be the main challenge for an Agile practitioner [33, p.133] [36, p.723]. "*Consequently, organisations may benefit from analysing the existing organisational culture even before they decide to start their transformation journey towards agile*" [33, p.136]. In the case of a hierarchical organisation that wants to incorporate an Agile approach, this means finding a way to transition from two opposite organisational cultures (from the bottom-left to the top-right on the Competing Values Framework quadrant illustrated by figure 3.3).

For example, waterfall-oriented project managers could complain about an incremental way of working because the team must constantly adapt to the changes in the environment. The ever changing environment is therefore seen as a sign of incompetence [19, p.204].

In a context other than engineering or computer science, "*avoiding excessive attention to the specific nomenclature associated with Agile*" [37, p.105]. It is more important to focus on an Agile mindset than on specific Agile terminology *per se*. Other difficulties could be: converting user stories into discrete tasks that can be accomplished within the available time; breaking free from the "traditional" divisions of labor, approaching sprints as separate units of work, each with defined objectives and not as traditional phases of a linear assignment, and requiring significant self-direction, especially with inexperienced team members [37, p.107].

4.6 Management support

Weak support from management can be an obstacle to the implementation of Agile [36, p.723]. Support should not be limited to accepting that an Agile project be conducted, but should also be imbued with the underlying "*management philosophy that should be adapted to each firm's specific needs and circumstances*" [26, p.1106]. If not, Agile would be reduced to a set of practices and tools, while the organization would "*continue to employ conventional management practices that undermine agile projects*" [26, p.1106]. This leads to a mismatch between the management style and the methods used, between the "what" and the "how". "*With the best of intentions, they erode the benefits that agile innovation can deliver*" [49]. To avoid this situation, leaders should adopt six postures [49]:

- Learn how Agile really works. Agile is neither anarchy (everybody does what he or she wants to) nor it is a way of doing things that "I" decide (as a leader) faster.

- Understand where Agile does or does not work. Agile is not a panacea. It is easier to implement under some conditions (such as those mentioned in the present chapter).

- Start small and let the word spread. The most successful introductions of Agile usually begin in IT and then might spread to other departments. When "it works" inside a team, the original practicioners naturally become coaches or evangelists within the organization.

- Allow "master" teams to customize their practices. This is the shu-ha-ri process, as mentioned in section 3.13.

- Practice Agile at the top. If all C-suite activities are not suited to Agile, some of them work well at strategy development, resource allocation, cultivating breakthrough innovations, improving organizational collaboration. "*Senior executives who come together as an agile team and learn to apply the discipline to these activities achieve far-reaching benefits. Their own productivity and morale improve. They speak the language of the teams they are empowering. They experience common challenges and learn how to overcome them. They recognize and stop behaviors that impede agile teams. They learn to simplify and focus work. Results improve, increasing confidence and engagement throughout the organization*" [49].

- Destroy the barriers to Agile behaviors. Tension is often reported between the Agile teams and the rest of the organization. Some techniques could be used to destroy such barriers:

  - Get everyone on the same page. Everyone should be able to see and work from the same list of priorities. A big picture of the whole project should be shared amongst various individuals and teams.

  - Don't change structures right away but change roles instead.

  - Name only one boss for each decision. "*People can have multiple bosses, but decisions cannot. In an agile operating model it must be crystal clear who is responsible for commissioning a cross-functional team, selecting and replacing team members, appointing the team leader, and approving the team's decisions*" [49].

  - Focus on the teams, not individuals. "*Studies by the MIT Center for Collective Intelligence and others show that although the intelligence of individuals affects team performance, the team's collective intelligence is even more important. It's also far easier to change*" [49].

– Lead with questions, not orders, such as: "'What do you recommend?' and 'How could we test that?' This management style helps functional experts grow into general managers, and it helps enterprise strategists and organizations evolve from silos battling for power and resources into collaborative cross-functional teams" [49].

Chapter 5

Definition of Agile

What is Agile? Even if Agile has been widely used for decades, there is no simple answer to this question. The Agile manifesto "only" states the values and principles of Agile. "*After 2001, the various alternative methods began to be referred to as agile methods with development groups referring to themselves as 'agile.' As the agile movement gained prominence, less and less attention was given to the disciplines underlying each of the methods. Thus the agile software development movement has exhibited a tendency toward homogenization of the different methods that gave rise to it. Today, agile software development is a mindset with a set of values, principles, and practices, but does not prescribe a particular process or set of processes. With increasing acceptance of agile values, principles, and practices, several phenomena have occurred*" [29, p.40-41]:

- Concept adaptation. Agile has been progressively and widely applied within the software development field as well as outside of this domain.

- Agile precedents. Agile concepts were found to be in use well before the Agile movement in software development.

- Research growth. As Agile has come from a practitioner-led movement, it has only received attention from academic researchers primarily in the last decade.

The meaning of "Agile" is therefore affected by these phenomena [29, p.41]. Some authors tried to express it as a definition while others as a set of characteristics. Fundamentally, these are intricate and constitute two sides of the same coin. Regardless of how one proceeds, it is important to qualify an Agile approach as objectively as possible. This would allow for a more nuanced measurement of Agile other than simply binary: it is Agile or not [29, p.57]. Another benefit of being able to adequately qualify an Agile approach is to provide "*a technical basis for the term and support clear communication about the merits, shortcomings, and suitability of development*

processes. Measurement of agility would lend objectivity to a number of practical concerns, from guiding and supporting process improvement decisions, to choosing a development method for a specific project, and to choosing the best group for a development project" [29, p.57].

5.1 Defining Agile

There is currently no universally accepted definition of Agile [13, p.37], neither in software development nor in other types of project management [33, p.133]. Moreover, "Agile" is becoming a buzzword used more and more in everyday life with a meaning that is a bit of a catch-all depending on the person using it. This makes it even more difficult to have a good perception of what it means.

An Agile approach is defined by Conboy and Fitzgerald as following: *"the continual readiness of an entity to rapidly or inherently, proactively or reactively, embrace change, through high quality, simplistic, economical components and relationships with its environment"* [13, p.40]. To arrive at this definition, they started from what they consider to be two essential underlying concepts:

- Flexibility. Behind this concept lie the notions of robustness or resilience *i.e.* *"the ability to endure all transitions caused by change, or the degree of change tolerated before deterioration in performance occurs without any corrective action. This concept indicates that in order to be truly flexible, an entity must not only be able to adapt to change by taking steps, but must also be able to embrace change by taking none"* [13, p.38]. The way in which this adaptation is carried out can lead to two different strategies: on the one hand, defensive, if the entity seeks to return to its original state, or offensive, if it also wishes to capitalize on the change to improve its position. The latter reveals the meaning of the term "embracing change": not only reacting to it but also influencing it.

- Leanness. This concept is relatively straight-forward and can be summerized in "doing more with less" and "eliminating of waste" [13, p.39]. It aims for *"the maximisation of simplicity, quality and economy"* [13, p.38].

5.2 Characterizing Agile

Instead of trying to define Agile, we can identify underlying characteristics. *"A general set of characteristics provides a basis for discriminating between conformance and non conformance to an ideal: a product development program can be described as agile to the extent to which it exhibits the*

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characteristics. Thus, one can use such a set of characteristics to assess, at least qualitatively, whether a development program is behaving as an agile program is expected to behave" [29, p.53].

Several models exist to induce what characterizes an Agile approach.

5.2.1 Methodological principles

Spontaneously, we could consider the twelve principles mentioned in the Agile manifesto as characteristics allowing the qualification of a project as Agile or not. But Meyer considers that they do not correspond to what a methodological principle should be, *i.e.* certainly both abstract and falsifiable, and rather prescriptive than descriptive (abstractness and falsifiability are mandatory, while the prescriptive aspect is preferable) [42, p.49]:

- Abstractness differentiates principles from practices. A principle should be a general rule, not a specific practice.

- Falsifiability distinguishes principles from platitudes. It must be possible to disagree with the principle, to envision someone supporting its negation (regardless of our own opinion).

- A principle should be prescriptive and not descriptive, it should direct action rather than stating a fact or property.

Meyer estemes that the original 12 Agile principles of the manifesto do not completely correspond to his definition of a methodological principle. Some are in fact practices, some are platitudes and some are incorrect assertions that could not be turned into correct prescriptions [42, p.50]. For this reason, he proposes a new, usable list respecting his methodological requirements (although somewhat software-oriented). Principes 1 to 5 are considered "Organizational" by the author, those remaining, he considers "Technical" [42, p.51]:

1. Put the customer at the center.

2. Let the team self-organize.

3. Work at a sustainable pace.

4. Develop minimal software:

    (a) Produce minimal functionality.
    (b) Produce only the product requested.
    (c) Develop only code and tests.

5. Accept change.

6. Develop iteratively:

   (a) Produce frequent working iterations.

   (b) Freeze requirements during iterations.

7. Treat tests as a key resource:

   (a) Do not start any new development until all tests pass.

   (b) Test first.

8. Express requirements through scenarios.

5.2.2 General Agile Characteristics

Houston crosses the original values and principles of the Agile manifesto (as shown in table 5.1) and observes that "*the values are not supported equally by the principles. Not only does each value statement represent a prioritization, but the set of principles represents a prioritization of the four values: 'individuals and interactions' and 'working software' are more supported by the principles than 'responding to change' and 'customer collaboration'*" [29, p.48].

Based on table 5.1, Houston derives General Agile Characteristics (GAC) beyond software development [29, p.50]:

- Interpersonal interaction

- Working product or service

- Customer/user collaboration

- Responsiveness to change

- Continual delivery of customer value

- Self-organizing, multifunctional collaboration

- Leadership by the motivated

- Technical excellence and simplicity

5.2.3 New new product development

A list of six characteristics from the era before the Agile manifesto was drawn up by Takeuchi and Nonaka [57]. Even if this was prior to Agile, it is still interesting insofar as Agile was not born out of thin air and has its origins in methodologies that were inspired in particular by this paper, which is now more than thirty years old. It was then a question of characterizing "the new new product development" process put in action in multinational

Agile principles supporting the Agile values	Individuals and interactions	Working software	Customer collaboration	Responding to change
Continuous value delivery		major	moderate	moderate
Welcome change			major	major
Frequent delivery		major		moderate
Business developer collaboration	major		moderate	
Motivation centricity	major			
Face-to-face conversation	major		minor	
Progress measure		major		
Constant pace indefinitely	moderate		moderate	
Technical excellence		major		
Simplicity		major		moderate
Self-organizing teams	major	moderate		
Reflect and adjust	major			moderate

Table 5.1: Agile values and principles matrix (Houston *et al.*, 2016)

companies for developing specific products with speed and flexibility. *"These characteristics are like pieces of a jigsaw puzzle. Each element, by itself, does not bring about speed and flexibility. But taken as a whole, the characteristics can produce a powerful new set of dynamics that will make a difference"* [57]:

- Built-in instability. *"Top management creates an element of tension in the project team by giving it great freedom to carry out a project of strategic importance to the company and by setting very challenging requirements"* [57].

- Self-organizing project teams. *"The project team begins to operate like a start-up company - it takes initiatives and risks, and develops an independent agenda. At some point, the team begins to create its own concept"* [57]. Three conditions are required to be considered as "self-organizing":

  - Autonomy: top management only provides guidance, money and moral support at the outset but on a day-to-day basis the team sets its own direction.

  - Self-transcendence: starting with the guidelines from the top management, the team establishes its own goals and keeps on elevating them.

  - Cross-fertilization: the members of the team come from various backgrounds, functional specializations, thought processes, behavior patterns, and personalities.

- Overlapping development phases. The team members need to share knowledge and synchronise their pace to meet deadlines. It begins to work as a unit and, as time goes by, the individual and the whole become inseparable. There is no more rigid sequence of specialized phases. Each team member feels responsible and is able to work on any aspect of the project. *"The overlap approach enhances shared responsibility and cooperation, stimulates involvement and commitment, sharpens a problem-solving focus, encourages initiative taking, develops diversified skills, and heightens sensitivity toward market conditions"* [57].

- Multilearning. *"Team members engage in a continual process of trial and error to narrow down the number of alternatives that they must consider. They also acquire broad knowledge and diverse skills, which help them create a versatile team capable of solving an array of problems fast"* [57].

- Subtle control. *"Although project teams are largely on their own, they are not uncontrolled. Management establishes enough checkpoints to*

prevent instability, ambiguity, and tension from turning into chaos. At the same time, management avoids the kind of rigid control that impairs creativity and spontaneity. Instead, the emphasis is on 'self-control', 'control through peer pressure', and 'control by love', which collectively we call 'subtle control'" [57]. It is exercised in seven ways: selecting the right people (monitoring shifts in group dynamics and adding/dropping members when necessary), creating an open work environment, encouraging engineers to go out into the field and listen to what customers and dealers have to say, establishing an evaluation and reward system based on group performance, managing the differences in rhythm throughout the development process, tolerating and anticipating mistakes, and encouraging suppliers to become self-organizing.

- Organizational transfer of learning. A transfer of learning can be observed to others outside the team but also in the organization by converting project activities to standard practices.

5.2.4 Conceptual framework

Conboy and Fitzgerald elaborated a conceptual framework which helps to identify if activities contribute to Agile or not. But the authors recognize that some activities are difficult to quantify. *"For example, delaying a decision until the environment becomes clear is a major contributor to agility. However, the relative cost, time and quality factors of such a delay are difficult to quantify"* [13, p.42].

That framework depicts *"four broad categories of activities an Agile team can carry out in relation to change"* [13, p.40]:

1. Change creation. The team initiates change. Its members are not passive, only reacting to changes originated from the customer or higher levels in the organisation. *"In simple terms, any action or ability can be deemed to be change creating if it causes a change that would not have occurred had that action not been taken or that ability possessed"* [13, p.41]. For example, even if a change is requested from outside the team (*e.g.* the customer), the team takes time to select or develop some alternatives that might fit.

2. Proaction. The team takes action to elicit changes before they actually occur (*e.g.* prototyping, decision delay, investment staging). *"Even if change can not be created, steps may be taken to predict change, minimise its negative impact, and maximise the potential to benefit from it"* [13, p.41].

3. Reaction. The team takes action in reaction to a change. A high-performance reaction would be quick, cheap and effective.

4. Learning. The team learns from the previous steps. It will be more creative, proactive and reactive during the next cycle.

"Robustness" is considered in this framework to be a product of proaction and therefore influences reaction. Well done proactive activities should reduce the need to react. "*The less reaction required, the higher the level of robustness*" [13, p.40].

"*Measuring creative, proactive and reactive activities in terms of their level of agility is done by comparing the number of changes identified and fulfilled by an activity to the cost of carrying out that activity. The greater the number of changes per €, the more agile the activity*" [13, p.40].

The "learning" activities are more difficult to measure as, unlike the three other categories, there is not a clear output. Nevertheless, we can consider that learning helps doing subsequent things more efficiently. "*So, if a team learn well from their first round of creative, proactive and reactive activities, the next round of activities should be performed even better*" [13, p.40]. In other words, considering the Agile continuous process, the next round of creative, proactive and reactive activities should have a better ratio "number of changes identified and fulfilled" by "cost", as illustrated in figure 5.1.
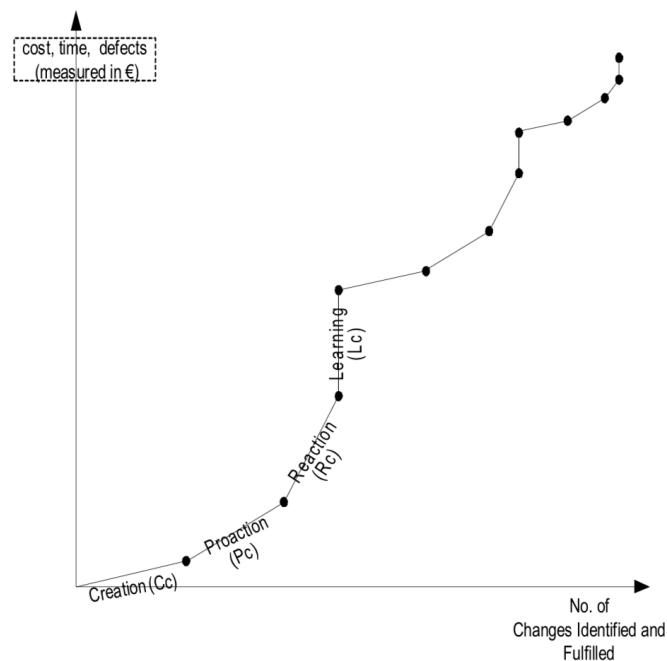

Figure 5.1: The concept of Agility as a continuous process (Conboy *et al.*, 2004)

Chapter 6

Exploring Agile in a police policy plan

6.1 Context

The Belgian police organisation is structured on two levels, both geographical and functional:

- The federal police unit works country-wide and performs specialized or transversal missions.

- The local police forces are currently divided into 185 units (originally 196 units in 2001 but there have been some mergers since then), each covering one or more municipalities. Each unit (*a.k.a.* "police zone") performs front-line missions inside its area.

Police policy is embodied in a series of documents that determine the priorities of the police for the coming years. It begins with a federal election in which a government is formed. This government issues a policy framework for security which is in fact an outline addressed to the concerned organisations (mainly the police) listing what priorities they should focus on. The police must then define its own action plan to operationalize the will of the government.

However, behind the police lie 186 independent units with no hierarchical influence over each other. In fact, the local police zones act under the combined authority of their territories' municipal mayors and the King's prosecutor. There is no structural hierarchy between the federal and local police, therefore each individual police unit (currently 186 in total) must elaborate its own policing plan (*a.k.a.* the "national security plan" for the federal police and a "zonal security plan" for each police zone). The national security plan is usually published first so that the local police zones can draw on it when drafting their zonal security plan.

The way a police zone develops its zonal security plan is framed by an interministerial note that changes with each legislature. This note covers only the main methodological principles which are strongly inspired by a waterfall approach. Each police zone has to define strategic objectives which are then broken down into operational objectives, which are finally the subject of concrete action plans. Each action is formulated in a SMART way and its progress is measured through KPIs. It is completely a plan-driven approach.

In the most recent note (PLP 58), available in the appendices, we can read that the implementation of the policy with the operationalization of the strategic planning can be done through the annual operational plans (*waterfall*) or through a more flexible form of implementation. This more flexible form of implementation and monitoring of the police policy is left to the discretion of each police zone, as is its reporting to the zonal security councils [23, p.3].

A little further on, we can read that flexibility is required. The current societal context, characterized by a high degree of uncertainty, rapid changes and a high degree of complexity, creates the need for more flexibility in the implementation of police policy. Disruptive events, rapid changes in crime trends and the need to seize new opportunities for organizational development and innovation mean that not everything can always be accommodated in strict plans set months or even years in advance. In regard to the implementation of the zonal security plan, the police are therefore asked to build some flexibility into the management of its plan. Although it is allowed to implement a more flexible approach for following up the policy, choices must be argued and explained.

For the first time in almost 20 years, an opening is thus left to the police zones to manage their zonal security plan. This is important because, empirically and informally, a lack of staff buy-in is frequently observed across different police units. One of the reasons for this lack of buy-in is that staff members are forced to perform actions in addition to their daily work without perceiving the strategic significance or even the value of doing so.

However, some police zones include staff members from their varied units in the early stages of the security policy development in order to elicit their input. Despite this, it remained quite laborious to maintain their buy-in once the actions to be carried out were completed and their efficiency was measured. One explanation lies in the fact that once the plan had been established, the actions were applied and measured for the duration of the plan, without really adapting them continuously to new changes and developments in the environment and needs.

Wishing to seize the opportunity of this methodological opening offered by the PLP 58 note, we contributed to the elaboration of the zonal security plan 2020-2025 for the police zone of Condroz-Famenne (province of Namur, Belgium) where we were employed. We chose to use an Agile approach for the implementation of strategic objectives as well as for their follow-up. This

choice was guided by several reasons:

- The PLP 58 note clearly indicated the need to develop a flexible approach. In addition, the zonal security plan template made available by the government textually recommended the use of an Agile approach. It is said that the option of moving away from 'static' action plans to an 'Agile' approach to policy implementation is certainly worth considering [64, p.20]. In another part of the document, reference is also made to the acronym VUCA (*i.e.* Volatile, Uncertain, Complex, Ambiguous) which originates from leadership theories for "being able to react to the unknown". They consider improvement of the organization's internal processes even more important than focussing on security phenomena themselves because these are far less predictable [64, p.18].

- Although most of the planned actions were well implemented in the previous police policy plans, we rarely achieved the desired statistical frequency targets. In addition, the lack of drive to contribute to the objectives was glaring and mainly due to the distance between a plan developed at the highest level of the hierarchy and what it entailed in terms of additional workload for staff members on top of their daily work. In other words, this lack of buy-in probably stemmed in part from a strategy that was too abstract in relation to day-to-day problems, which in turn led to an additional workload. Moreover, the decision-makers of the plan were not those responsible for its implementation, which further increased the time lag. The Agile approach was promising for giving staff members the opportunity to intervene both in defining operational objectives and in their implementation. It is more empowering to carry out actions that one has contributed to defining rather than executing actions decided by others.

- Following evening courses in computer science faculty, we had the opportunity to experiment with the Agile approach. Although this was done in the context of software development, the experience ably demonstrated the interest of using this approach and inspired the idea of implementing it in another field.

- The Chief of the aforementioned police zone was open-minded enough to listen to our proposal and dared to implement an innovative approach to managing the zonal security plan.

These various elements influencing the implementation of Agility confirm what we have had the opportunity to observe in our literature review. For example, the first and third elements of the aforementioned reasons concern an influence "external" to the organization that initiates an Agile approach, although in the majority of the articles reviewed, the external influence came

from positive experiences in IT departments. The second reason was also mentioned in the literature review as a benefit of the Agile approach through the involvement and motivation that it generates among team members. The fourth point is related to the support needed from top management to initiate change.

6.2   Zonal Security Plan

Even if the police unit's authority was in agreement, the procedure for submitting the zonal security plan remained plan-driven and involved certain milestones. In this case, the plan must first receive the approval of the zonal security council, which brings together the local administrative and judicial authorities, and secondly, it had to be validated by the ministers of the interior and justice.

It was therefore necessary to draft the zonal security plan in the manner prescribed by PLP 58, while providing for a management method inspired by Agile and applied to a field other than IT. Moreover, the public that needed to be convinced was not at all familiar with this approach. It was therefore necessary to demonstrate creativity, pedagogy and a spirit of synthesis.

The zonal security plan is publicly availableand we have included the relevant chapters in the appendices. This extract is dedicated to the way we were going to implement it to ensure its follow-up over six years, while remaining flexible and capable of adapting to changes thanks to the Agile approach. After a presentation of Agility in general and its origin, we proposed a way to apply it to the monitoring of a police policy. Let's recall that while the PLP encouraged monitoring the policy in a more flexible manner, it did require an explanation of the methodology if a traditional waterfall approach was not applied. As we wrote this chapter of the zonal security plan, we allow ourselves the right to translate the most relevant part (*i.e.* the title 4.1.3.2) into English (the original text was written in French) [20, p.67-70].

To our knowledge, there is no transposition of the "Agile" methodology for projects other than ICT within the police force in Belgium. Convinced by the advantages offered by such a methodology, we have the ambition to adapt it to the functioning of our police force. As with any transformation, this will involve trials and adjustments. This way of working with flexibility, and especially "adapting to change", is highlighted in the manifesto mentioned above. What follows is therefore the beginning of the application of an "Agile" methodology for monitoring the zonal security plan. It is possible and even probable that adaptations will be made over time.

Time will be set aside in the steering committee meeting to review the monitoring of the policy. Our strategic analyst, who is a member of the committee, will be in charge of follow-up and methodological support.

Before starting the first cycle, a list of concrete objectives to be reached by priority of the zonal security plan will be established (generally called "backlog" in the jargon). In accordance with the philosophy of adaptability of the approach, this list is likely to evolve over time (refinement, new event,...). It is therefore not necessary to force ourselves to "think of everything" at this point. For each objective, it is ideally a matter of targeting the desired end product/service and managing to express it in the form of a need to be satisfied, such as "as [role], I want [action] in order to [reason/justification]."

Once this list has been compiled, a priority level is given by the steering committee to each of these objectives and will determine the order in which they will be addressed. For each objective, a small multidisciplinary team concerned with the objective will be formed (maximum six people). The steering committee determines which "profiles" (in whole or in part) should be included in this team, depending on the specificity of the objective, or by default considers that each team should include a member of each directorate to ensure that there is a representative from each specialty. It is assumed that the team, whose members are directly or indirectly concerned by the issue at stake, is best able to determine how to provide a satisfactory solution to the need being addressed. Moreover, the composition of a transversal team contributes to decompartmentalize the services. A call for volunteers will then be made within each department to fill these profiles.

The team has one iteration (one loop) to complete the objective. The first meeting aims, on the one hand, at the precise determination of the expected product, in accordance with the needs and constraints identified by the team members and, on the other hand, at the division of the objective into tasks which, put end to end, allow the team to reach it. Each task should not exceed a quantitative workload of several hours. Once the tasks have been determined, each member of the team chooses the ones he or she will take on. At the end of the cycle (loop), team members are expected to have completed their respective tasks. Regular meetings should be held to monitor the progress of the tasks. In the case of a full-time team, a 10-minute minimeeting is held daily. In our case, the meeting will be weekly and will last about 30 minutes.

At each management committee meeting, the progress of the objective is reviewed. There is nothing to prevent several teams from making progress on several objectives in parallel, or the same team from working on several objectives. It is only important to be realistic about the estimated workload and time that each team member has available to work on the objective in addition to their daily work (they remain assigned to their original department and do not work on the project full time), in order to avoid demotivation leading to the failure of the process.

Once the cycle is complete, the list of objectives is adjusted to reflect new developments and the process described above is repeated. To determine whether an objective has been achieved, it must meet the definition

that the management committee wishes to give. The simplest way to consider an objective achieved is when the statement expressed in the objective definition actually applies ("as [role], I achieve [action] in order to [reason/justification]"). However, one could decide to accompany this requirement with additional quality criteria (e.g. the process is formalized in a procedure known to the staff members, the process has been applied for one month without identified problems,...).

Generally speaking, the entire process can be revised at (almost) any time. Pragmatism is the strength of this methodology, and particularly the attention given to working around problems (minor or major) encountered (hence the importance of daily or weekly meetings to bring them out). This is why the approach is carried out in short cycles (a few weeks), in order to be able to adapt before the beginning of the next cycle. Consequently, the only limitation to the revision of the process is to wait until the end of the current cycle.

Let's take an example. Under the theme of combating incivilities, a series of objectives are listed at the steering committee level. Among these is the prevention of waste dumping outside the scheduled collection times, which would have been considered a priority. The way in which the objective is expressed depends on the tone that is being sought: preventive, proactive, reactive, informative, flexible, tough, etc.

For example, it could be formulated: "As a neighborhood agent, I would like to be informed of the garbage dumped in front of the buildings in my neighborhood, except from the day before the garbage collection day at 6 p.m. until the time of the collection itself, in order to assess the extent of the problem". The scope of this objective is therefore, at this stage, information gathering. The beneficiary of this objective is the Neighborhood Officer. The reason is to assess the problem at this stage, but it is conceivable that other actions (objectives) will follow depending on the results that emerge.

At a minimum, the team should consist of a neighbourhood agent, a statistician, a patrol officer, but one representative from each branch could be considered. Good ideas can come from anywhere. The team will then exchange ideas until they determine the final product that meets everyone's needs. For example, a SharePoint space with the addresses of the buildings where the illegal deposits were found and the time of the observation. This space would have a filter that would allow each Neighborhood Officer to easily access the addresses relevant to the neighborhood for which they are responsible. The analyst would be able to compile overall statistics at the level of the police zone and with a temporal evolution.

Roughly speaking, the main steps of the process to be put in place are the construction of the SharePoint space in question, taking photos and location data by depositing garbage bags, bring this information up to the SharePoint.

Different tasks will have been determined by the team in order to achieve the result by the end of the cycle. For example, taking pictures and loca-

tion data involves: setting up a process (internal note), providing equipment (camera) or accepting the use of personal smartphones (internal rules), the question of whether one is entitled to do so (GDPR),... The creation of the SharePoint space requires a reflection on the data and metadata useful to achieve the desired result; which users should be able to access and with what rights; is there enough bandwidth if we have to transmit large volumes of photos; how will the location data be coded; how long can the data be kept;...

If the Agile approach was going to be used to monitor the zonal security plan, the general direction of priorities was still determined beforehand. In concrete terms, eleven strategic objectives were determined on the basis of criteria that are explained in the zonal security plan, although we will not develop them here as they are not relevant to the subject under discussion. As a result, eleven Agile teams had to be formed to determine, within the framework of each objective set, how to operationalize a contribution that would take into account the different stakeholders.

6.3   Refinement of Agile implementation

Once the plan was approved by both local and federal authorities, we had to refine the Agile approach. It would be necessary to make it operational within the police context and with the objective of managing a project that was totally different from making a software product. We therefore designed the following model. As with many of the adaptations noted in our literature review, we used Scrum, due to its generic flexibility.

The whole purpose of adopting an Agile approach was to put in action the zonal security plan. The zonal security plan is a police policy document consisting of two components: a comprehensive picture of security and quality of life, and a series of strategic priorities to which the zonal security council chooses to pay particular attention. These priorities may relate to combating external phenomena, but also to improving the operation of the local police unit (typically improving processes). Determining priorities is only a first step that should ultimately lead to concrete achievements. There is no point in declaring that the fight against a certain kind of violence is a priority if nothing is concretely put into place. The plan itself is not enough, it must be converted into actions, it must be operationalized.

Before the Agile approach came into play, a rather rigid methodology was imposed on police units in the effort to implement the security plan. Based on strategic priorities, operational objectives (SMART) had to be stated. For each of these objectives, an action plan had to be drawn up (list of concrete actions to be carried out). Next, an indicator monitoring plan was to be drawn up to ensure that the actions listed were carried out properly (KPI). Finally, a report must be presented annually to the zonal

safety council to report on the monitoring of each strategic objective.

Our goal was to replace this waterfall methodology with the Agile approach wherever possible, particularly after the strategic objectives have been determined and before the report has to be sent to the zonal security council. Evidently, as these two milestones are imposed by legislation, they have to be respected. However, as the PLP 58 note authorized the use of another approach for monitoring the zonal security plan, we could replace this piece of the puzzle. Figure 6.1 illustrates precisely where Agile could be implemented (in yellow) throughout the entire police policy process.
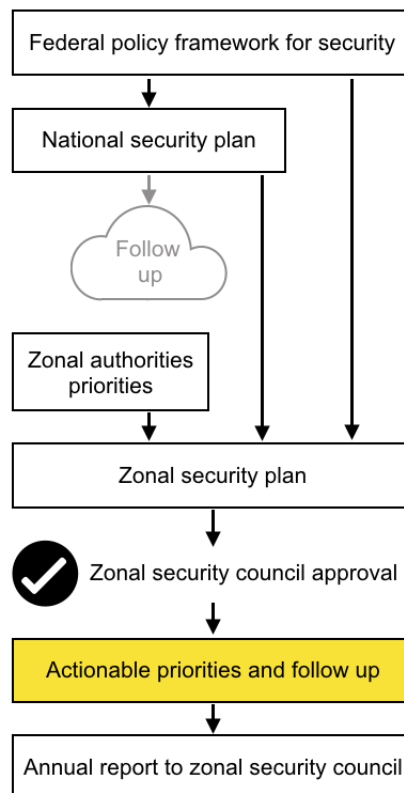

Figure 6.1: Making the police policy plan priorities Agile.

The main elements of the Agile approach as we proposed to implement are the following: the steering committee (which brings together the officers of the police zone) determines an objective to be achieved (the "what") as part of a zonal security plan priority. A team of colleagues directly concerned by the objective would be set up to think about how to reach this objective (the "how") and to carry out the tasks to achieve it (the "do"). This team, a real engine of change, would be responsible for producing an outline of the result within a month. This sketch would be presented to the steering committee, which shares its comments (how well the sketch produced is in

line with the objective pursued). The team would continue to work on the draft, taking into account the feedback received. After a month, the loop is repeated. This continues until the result is considered satisfactory by the stakeholders. At this point, the result would be considered to have been achieved and the team would be dismissed.

The main advantages of this approach are the following:

- Collective intelligence is at work and necessarily takes into account everyone's imperatives. The team therefore avoids the risk of inconsistency between decisions taken and practical unfeasibility of implementation. It is the people directly concerned by the problem being addressed who are working on it.

- The team organizes itself to get to the heart of the matter. Only the rules determined by the team itself apply to the group's functioning. The focus is on the result itself.

- The methodology reduces formalism and meetings to what is strictly necessary for the team to organize itself in the best possible way in view of the result.

- A change or a novelty is quickly taken into account. Receiving feedback every month, the team can readjust the trajectory to produce the result fairly quickly.

Figure 6.2 shows the application of the Agile approach in the monitoring of the zonal security plan. The different steps are detailed in the following sections. To facilitate navigation between the different stages, we will use the same headings as in the figure.

6.3.1 Security plan

As published and available to the public, the Zonal security plan 2020-2025 for the police zone of Condroz-Famenne includes 4 security priorities and 7 operational management priorities:

- Contribute to controlling road safety

- Contribute to the control of burglaries

- Contribute to the control of intra-family violence

- Contribute to mastering incivilities

- Develop partnerships with other police zones or public entities

- Developing partnerships in the youth field

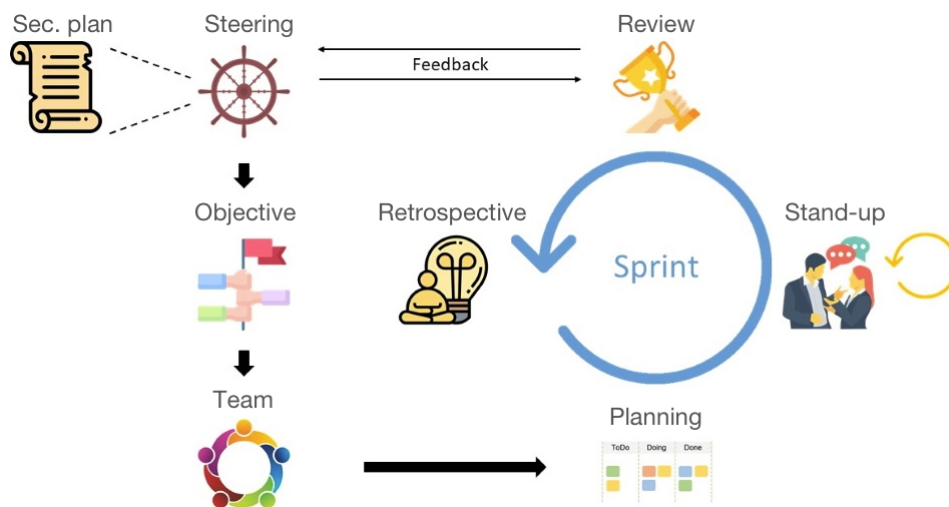- Developing partnerships with the agricultural world

Figure 6.2: Implementation of an Agile monitoring of the zonal security plan.

- Develop partnerships with the public and private security sector

- Developing our information security management

- Streamline internal communications

- Consolidate the reorganization of outreach work

6.3.2 Steering

For each of the different priorities, the steering committee will determine objectives based on the needs of the organization at the time of the decision. There is therefore no "complete" list of objectives to be specified at the beginning of the zonal security plan cycle. As the needs of the organisation become apparent, they can be added to the list. This also gives the steering committee a great deal of flexibility to react quickly to events or local news throughout the lifecycle of the zonal security plan.

6.3.3 Objective

Each objective will be formulated as clearly as possible based on the available information. In some cases the objective will be very precise, while in others the objective itself will need to be refined. Ideally, the expression of the objective will consist of a story expressed in the following way: "As [role], I wish [what] in order to [reason]." A few examples:

- "As Chief of police, I wish to have a strategic analysis of intra-family violence cases in order to identify the local particularities in this field".

- "As the neighborhood officer, I would like to be informed of any garbage left outside the buildings in my neighborhood outside of scheduled hours in order to assess the extent of the problem."

- "As the zone's secretary, I wish to be informed in a timely manner of the items to be submitted to the Police college agenda in order to avoid unnecessary postponements and the need for time extensions".

- "As a member of the intervention service, I would like to see a chart or tree structure of the different administrative fines clearly presented in the information system as this would help me efficiently find the legal qualification matching the behaviour".

- "As a Mayor, I would like road checks to be reinforced for several days in places where an accident has occurred in the previous 48 hours in order to carry out direct preventive action with road users."

- "As Chief of police, I would like to know what the needs of the different operational services would be in order to best manage law enforcement operations in an agricultural environment."

An objective must be precise enough to allow the team to start working. But it doesn't matter if it's not totally complete. An agile approach progresses by successive polishing, so the objective can be refined along the way.

Regardless of the [role] whose perspective is taken to formulate the story most adequately, the steering committee remains the sponsor of the objective and therefore the validator of its achievement. The choice of the [role] contributes to providing a viewpoint to better define the objective being pursued. Similarly, the [reason] is not intended to be a form of justification, but rather to ensure that the [what] is understood and to avoid misinterpretation.

6.3.4   Team

After determining the objective, the steering committee mandates the product owner. The product owner will be part of the team. His role is to fully understand the objective and the issues at stake, as he acts as counsel to the management committee. The idea is simply not to bother the steering committee every time a question arises.

The rest of the team should then be composed of people directly interested in the objective (examples: known field, end user of the product, specific expertise required,...), as they will be expected to reflect and achieve the expected objective. It would therefore be counterproductive to appoint people who have neither the interest nor the desire to contribute. The constitution of the team can be chosen using two different modalities or a mixture of both:

- Free call for participation. Staff members are informed that a team with a specific objective is being set up and those who are interested are welcome to join.

- The management committee determines the required profiles. For example, the objective relates to burglaries, and it is estimated that at least one member from the detective department, one techno prevention advisor, and one member of the victim's assistance service would be required.

The number of team members as a whole must remain contained (typically between 3 and 9) so that a healthy emulsion can be achieved without the group becoming too large and incapable of self-organization.

Before entering the first sprint, a prelude meeting is organized in a place where everyone feels comfortable. The team draws up a list of stakeholders, *i.e.* anybody who will be impacted or interested in the outcome of the objective to be achieved. As the use of Agile is new to the organization, the framework and tools used are presented by the scrum master who acts as guarantor of the Agile approach, facilitator and sometimes even animator.

Next, the team builds its ecosystem:

- It determines the duration of a sprint (between 1 and 4 weeks), which is the period of time that punctuates the team's life between planning and retrospection. This duration will be fixed until the objective is reached.

- It defines the team's rules for decision-making (*e.g.* majority vote, points vote, etc.).

- It determines how the members will be able to devote themselves to the project in parallel with the daily work in their respective departments.

- It agrees on what is meant by "finished". What are the criteria for determining that a story is finished? So far, only the main objective formulated in story form has been discussed, but it is very likely that this will be subdivided by the team into other stories in order to break up the work.

- When will the four sprint rites be organized? Either on specific calendar days, or at specific frequencies (for example: for the scrum, every day at 8 a.m. or Tuesdays and Thursdays at 10 a.m.). The interest here lies in the fact that the team avoids last minute, time wasting searches for a time slot that suits everyone.

6.3.5 Planning

Based on the objective stated by the steering committee, a breakdown into work packages is carried out by the team. This is a common process in any project management (for example, there are many things to do in between the idea of having a house built and actually living in it). The team must therefore identify the different "things to do" in order to achieve their goal. Not everything has to be planned down to the final result (as it is in "cascading" project management). Minimally, it is a matter of listing enough things to do to fill the time that team members are willing to devote to the project as part of the sprint.

Each work package is formulated in the form of a story, *i.e.* "As [role], I want to [what] in order to [reason]." It is not a question of over-formalizing, but just of identifying the main elements that will enable all team members to understand precisely what is expected. If a story requires a significant amount of work to complete, it can be broken down into tasks. It should be possible to complete a task in a few hours. The nuance between a task and a story is not only the subordination of one to the other (although a story could very well depend on another story), but above all, the fact that a task has no interest by itself. It is limited to contributing to a story but is not autonomous. On the other hand, a story, once completed, provides added value on the path to achieving the goal.

An Agile approach aims to quickly add value to the objective. In other words, stories must be ordered according to their importance (no two stories can have equal priority). Although he is strongly encouraged to take into account the opinion of the entire team, the product owner has the responsibility to decide which priority to give to which story, even against the opinion of the rest of the team. As the person who is the best informed about the needs of the steering committee, he or she is expected to identify more easily what will have maximum effect while minimizing the team's efforts. This is the only breach of equality between team members in the entire Agile approach: only the product owner has the last word concerning the scheduling (only scheduling and nothing else, such as the breakdown, for example) of stories.

The set of stories, or tasks, listed in this way constitutes the backlog, *i.e.* all the things to be done (stories, problems to be corrected) in order to reach the final objective. It is often represented in the form of a kanban-type board in order to apprehend it in a simple and visual way, as illustrated in figure 6.3. Typically, several columns are represented, such as: draft (simple ideas), to be refined (ordered stories but too voluminous or imprecise), ready (ordered stories ready), finished (stories finished according to the definition of "finished" established during the prelude). The stories are often materialized in the form of a sticky-note. This allows the sticky-note to "travel" between the columns and be annotated (*e.g.* to know who is in

charge). In short, this mode of visual representation is flexible enough to "live" according to the potentially changing needs of the team (*e.g.*: add columns, provide a division into rows, use color-coded sticky-notes, ...).
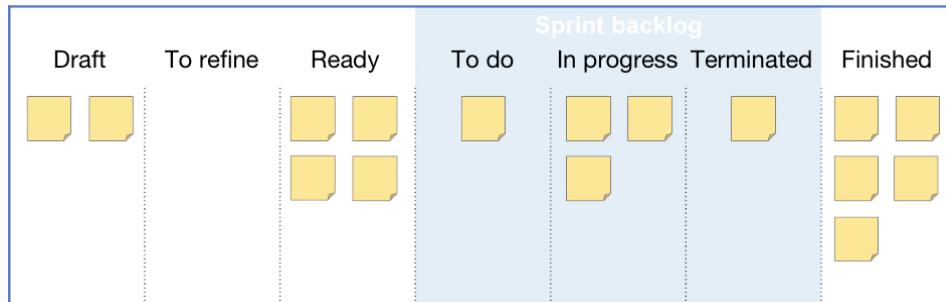

Figure 6.3: Illustration of a kanban.

The sprint backlog is an extraction of the stories that the team commits to achieve by the end of the sprint. The selection depends on the complexity of the stories, the team's velocity, the workload estimate, the order of priority, etc. Typically, a few columns are added to the kanban between "ready" and "finished": to be done (grouping the selection of stories for the sprint), in progress (assigned stories in progress), terminated (according to the perception of the team member in charge). The passage from the columns "terminated" to "finished" is decided as a team (according to the definition of "finished" established during the prelude) and singularly by considering the opinion of the product owner.

Once the sprint backlog is known, the team members choose the stories or tasks they take on. The choice can be made out of personal affinity, a desire for challenge,... It is not necessary that all the sprint stories are assigned to someone from the beginning. However, it is necessary that everyone takes charge of at least one in order to be able to start working. Once a story is finished, the team member who was in charge of it selects a new one. And so on, for each team member, until the end of the sprint.

6.3.6 Stand-up

On a very regular basis (the frequency of which was determined by the team during the prelude), the team meets briefly (about 15 minutes) to take stock and synchronize as needed. Each member answers three questions:

- What have I done since the last stand-up meeting to help the team reach the goal?

- What do I plan to do between now and the next stand-up meeting to help the team achieve the goal?

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- Is there anything preventing me from moving towards this goal?

The scrum master is particularly attentive to blocking points. As a facilitator, his or her task is to do what he or she can to remove obstacles to help the team stay focused on the goal (*e.g.*, by contacting stakeholders outside the team who could have a positive influence and help to solve the problem).

6.3.7 Review

Stakeholders are invited to attend a presentation of the team's results (or at least of the stories considered complete). This is mainly aimed at the steering committee or one of its delegates, but it can concern anyone who might be interested in the result.

In addition to proudly presenting the result currently being produced, the team benefits from the review by getting direct feedback from the parties interested in the objective. Here lies the responsiveness that an Agile framework can offer compared to conventional project management, as this feedback enables the project to be quickly put back on track if necessary, for example, following a change in the environment or current events that force the steering committee to revise its objective.

6.3.8 Retrospective

The retrospective is not oriented on the result to be produced but on the analysis of the functioning of the team. It is a key step in self-organisation designed to take stock and verbalize problems encountered with the way of working. Amongst these, the team chooses the one considered the most important to resolve. It is written on the kanban with the objective of solving it by the end of the next sprint.

6.4 Agile experimentations

The Agile approach was presented to all police unit personnel. This method of managing a project was completely new to them. The zone Chief decided to implement this approach as part of a working group that had been previously set up to solve an internal operational problem that had nothing to do with the priorities of the zonal security plan. At that time, the working group had only been defined by the zone Chief but had not started working. He thought it could be a good idea to conduct the group's work using an Agile approach. More or less at the same time, the steering committee identified three objectives within the framework of the zonal security plan for which the Agile approach was being initiated. However, at the time of writing this document, only one team could only be formed for one of

these three strategic objectives. The constitution of this team was done on a voluntary basis. In summary, we had two teams within which it was possible to experiment with the Agile approach:

- One team of six members targeting a priority in the zonal security plan. This team was set up on a voluntary basis. We sent an email to all staff members outlining the team's goal. All volunteers were welcome. We asked some profiles more personally if they were interested in participating as their function was directly related to the team's objective. Most of them accepted, others refused, but nobody was forced to participate.

- One team of seven members targeting the resolution of an internal operating problem outside the zonal security plan. This team was defined by the zone Chief as specific roles were required because of the very particular problem to solve.

In order to respect the confidentiality of police operations, we will not discuss the content of this work here. Rather, we will examine its methodological scope. We will therefore limit ourselves to expressing how the approach was carried out and the tools used. Moreover, since these were similar for both teams, we will discuss them globally by considering three moments: the set up of the first meeting, the group work, and the conclusion of the first sprints.

6.4.1 Setting up the first meeting

Various constraints were taken into account when planning the first meeting:

- The team was not dedicated full time to the project. In fact, it was planned that members would only give a few hours per week to the project, depending on their availability. Most of the time, the team continued their regular work.

- The team members belonged to different departments, each of which operate in a different way. First, they can be physically located in buildings several kilometers apart. Second, the organization of working hours may be different: a classical daytime schedule between 8:00 a.m. and 5:00 p.m. or a shift work outside the usual hours. Third, team members report to different department heads who may have their own requirements.

To find a date that would take these constraints into account, we proposed to each member to indicate his/her availability (taking into account the constraints of his/her department) via a shared scheduling tool (*i.e.*

Doodle®). With this type of tool, we proposed a series of dates and time slots for which participants indicate whether they are able to participate. It was not easy to find a common date, notably because several iterations of date proposals had to be made (*e.g.*: no day of a series was suitable), or because the level of reactivity was variable among the participants to indicate their availability. When a date was convenient for the whole team except for one person (especially when this person had no control over his schedule, *e.g.* shift work), we played a facilitating role by directly contacting his/her manager so that an arrangement could be found. In the end, it took a few weeks to find a date that worked for everyone, which was scheduled some weeks later. More than a month had passed between the time it was decided to hold the meeting and the time it actually took place.

We preferred a meeting where all participants were physically in the same room. This was not the easiest choice considering the health context that the world was (and still is) experiencing because of COVID-19. Nevertheless, it seemed to be the most appropriate choice compared to a video-conference session as it was necessary to inspire the participants to enter into a project management dynamic that had never been used in our organization. Furthermore, considering the difficulty of finding a common date, this would probably be the only meeting that could be conducted during the sprint. It was therefore necessary to capture the full attention of the participants in order to achieve the goal of this meeting.

At the end of this meeting, we wanted the backlog to be developed and each participant to know clearly what was expected of him or her during the first sprint. To achieve this, three main phases were planned during the meeting:

- Firstly, we had to provide a minimum of prelude, the phase where the team meets and organizes itself. This was a short period at the beginning of the meeting due to lack of time. We made a series of proposals, taking care to ask if it was convenient for the group. The ideally advocated self-organization was therefore a bit biased.

- Secondly, only the general objective was known. We then had to define how we could achieve it. This was a problem-solving approach.

- Thirdly, starting from the assumptions considered in the previous point, we had to formulate user stories and clear tasks that could be achieved despite the limited time that the team participants could devote to this project.

We used a methodology called the "Lightning Decision Jam" [18] (requiring a board, markers, and sticky-notes) that takes place in 8 steps:

1. Start with things that are working. After drawing a sailboat with an anchor on the board, each participant writes down, without consulting

the others, the things that go well with the topic, one idea per sticky-note. After a few minutes, the sticky-notes are read aloud and then stuck above the boat to symbolize the wind that helps the boat move forward.

2. Capture all the problems. This step is similar to the first one, except that the negative points are targeted and sticky-notes are stuck under the boat to symbolize what slows it down, like the anchor.

3. Prioritize problems. Each participant is given 3 red dots to stick on the issues they consider as priorities. They are distributed according to his will, several dots from the same participant can appear on the same problem.

4. Reframe the problems as standardized challenges. Priority issues were rephrased collectively in the form of "How might we...?" The goal was for everyone to understand the problem in the same way. This form of question was written on a specially formatted sticky-note note to distinguish it from the others.

5. Ideate without discussion. For a few minutes, participants individually and silently search for as many solutions to the priority problems as possible, writing down one idea per sticky-note. Quantity is preferred to quality: at this stage it is important not to censor oneself and to let one's imagination run free.

6. Prioritise solutions. As during the third step, each participant is given 3 green dots to stick on the solutions they consider as the best ones. Several dots from the same participant can appear on the same solution.

7. Decide what to execute. Based on the list of prioritized solutions, it should be possible to estimate the impact and effort required. A simple matrix is used to position them in relation to each other according to the team's opinion. In concrete terms, for each solution, the team positions it first on the impact axis, then on the effort required axis. This is repeated for each priority solution listed, comparing it to those already located on the matrix (*e.g.* does this solution have more or less impact than that one?). Figure 6.4 then suggests how to address the solutions according to the quadrant in which they appear: starting with the ones that bring high impact and cost low effort.

8. Make solutions actionable. For the solutions that the group has decided to implement, collectively think of three steps to start putting it into action.
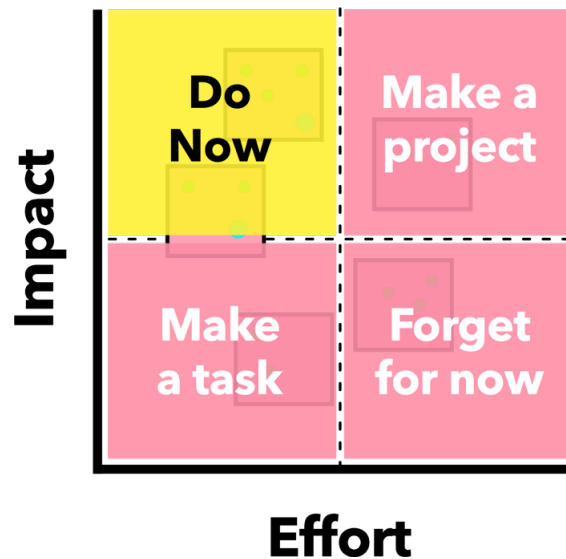
Figure 6.4: Effort/Impact scale used to decide which solutions to execute in the 7th step of the Lightning Decision Jam method.

The last three steps were not implemented in such a delimited way as in the method just presented, for a simple reason of timing (the meeting had already been long enough). Moreover, considering that the team was part of an Agile approach inspired by Scrum, we tried to formulate user stories. These were then to be broken down into tasks that could be carried out in the daily life of the participants (who were not assigned to the project full time). At the end of the session, we held a kanban and each participant had voluntarily chosen a task that he or she would take on to initiate the sprint.

6.4.2 Following the work of the group

Traditionally, an Agile team is gathered in a shared office with a kanban board accessible to all at all times. This was not the case here: each member continued to work in his department. Therefore, we used an online collaborative tool (*i.e.* "Microsoft Teams"®) to virtually recreate the necessary tools.

The "list" module was used to rewrite the user stories that the team had developed. Like a kanban, it took the form of a sticky note that a member could assign to himself to indicate to the others that he was in charge of it.

A "wiki-like" page was developed to simulate the short daily meeting. Unfortunately, this frequency was not feasible. We therefore opted for a weekly synchronization because the members would not have the opportunity to work daily on the project. Considering the difficulty of synchronizing the agendas, we proposed a table to be filled in by each person every week

to indicate what they had done, what they intended to do and what was blocking their progress. Everyone could fill it in asynchronously so that it could be managed within the framework of their main activities.

Of course, all relevant files were shared in the same collaborative tool and the instant chat was regularly used.

6.4.3   Concluding the sprint

The experimentation of this new way of managing a police policy plan unfortunately stopped before reaching the review stage and thus the retrospective. We left the organization before a date could be found to present the team's deliverables to the steering committee. To our knowledge, the management of the zonal security plan with an Agile approach ended there.

Chapter 7

Discussion and future work

7.1 Discussion about the literature review

It was not easy to automate the search criteria for conducting a literature review regarding the implementation of Agile outside of software development. Two approaches could be taken to develop a query. Either we explicitly mention all the sectors we are interested in (although it is not possible to guess in advance where Agile has been applied since that is precisely what we are looking for), or we remain generic while requiring a specific mention of the fact that it does not concern an IT project. The latter option was chosen, with relative success for two reasons:

- Starting with 496 references, we retained 24 papers in the first round based on a manual approach, a ratio of 4.8%. There were certainly a few duplicates but mostly a lot of out-of-scope items.

- Nearly half of the papers constituting our final review inventory were obtained by rebounding from the bibliography of the 24 papers initially found (and still performing the same manual sorting as for the first wave).

One element to consider would be to target Scrum more specifically. Our search criteria targeted Agile in a broad sense. But it would probably have been interesting to mention Scrum as well insofar as, based on the cases observed in our literature review, most of the Agile experiments carried out in other domains than IT are based on Scrum as it is quite generic in its methodology.

Generally speaking, there is a semantic aspect to the search that we could not express in an automated query. For example, one could imagine that a non-IT project (*e.g.* improving an HR recruitment process) is carried out via an Agile approach in an IT company. This would have interested us, whereas it would not have been the case if the project had concerned

the addition of functionality in an application used by HR in the same company (because Agile would have been used its usual context: software development).

Some authors note a small number of empirical studies regarding the use of Agile outside of IT (*e.g.* [11, p.333,336]). We make the same observation. Perhaps this can also be explained by the difficulty of finding a methodological approach to circumscribe the field during a literature review.

7.2 Discussion about the experiment

During our experiment to implement Agile in the monitoring of the zonal security plan, we were both a practitioner aiming to activate a change in the organization and a researcher aiming to study the process. It was therefore a form of "action research" (*e.g.* [52] for an example of usage in Belgium) which could be defined as "*a family of research methodologies which pursue action (or change) and research (or understanding) at the same time*" [2, p.131]. According to Altrichter *et al.*, this research model is essentially based on four successive phases: planning, acting, observing, reflecting [2, p.130]. The attempt to put Agile into practice lasted only a few weeks before being stopped during the second phase (acting) because of our departure from the organization. Even though we collected little information, we were able to draw some observations.

Although the experience was short-lived, we received positive feedback from team members about the process. However, this could not be objectively measured through a structured before/after survey. Nevertheless, although it is very subjective, we perceived a positive attitude from team members, including those who were initially a bit more cautious about the process. In addition, team members were committed and found the time to make progress on the tasks they had chosen to take on. This was materialized by the existence of deliverables, although these did not have the opportunity to receive feedback from the client (the steering committee).

Introducing Agile (or more generally a change) in an organization requires strong management support. In this case, there was support, but it was aimed more at the change agent (us) than the implementation of Agile itself. Our proposal to revise the follow-up of the zonal security plan was accepted and supported by the zone Chief, but not pursued after we left. So we had his support, but not the implementation of Agile as such.

It was difficult to implement an Agile approach with a team whose members continued to belong to their original departments without any particular adaptation of their workload. The work to be done by the team was therefore additional. Establishing synchronization times for meetings (even brief ones) took time, especially for members who had no autonomy to plan their work time (*e.g.* a shift work). Moreover, this implies an equivalent ad-

hesion to the project by the respective heads of department of the different members of the team, which was not always the case.

From a practical point of view, considering the steering committee as the final customer in charge of giving feedback is likely to create a bottleneck and increase the timeboxing problem: other items are scheduled on the agenda to manage the organization from an operational point of view, the duration of the meeting is likely to increase greatly as more and more Agile teams will be formed,... It would probably be more efficient if the steering committee designates, for each Agile team formed, one of its members in charge of giving the team the expected feedback at the end of each sprint.

7.3 Future work

Although the implementation of the project was brief, its termination was not the result of an intrinsic failure of the process. Our thesis has opened a new field of experimentation of an Agile approach even if the scope is quite specific as it targets a (large) process of potentially 186 units behind a single (large) public organization working in a very specific sector. To our knowledge, we were the first to have tried this approach in this context in Belgium, both a Scrum-based model fitted to the police policy plan process and an experimentation of it. We believe that the Agile approach in the context of monitoring a police policy plan is not only feasible but desirable for making this plan more actionable and responsive.

We therefore encourage those responsible for monitoring security plans, whether local or federal, to continue experimenting. Each plan typically has a plethora of different objectives. It is therefore possible to test the Agile approach on one objective and evaluate the results. Agile can be incorporated bit by bit.

In retrospect, our experiment was positioned more as a proof of concept. We offer some suggestions on how to go further, both for researchers and practitioners:

- This is obvious, but since our experiment was closed before the end of the first sprint, it is important to test the approach to the end by performing several iterations.

- Continue the work of Houston *et al.* [29] by developing measurable criteria to qualify the 6 general characteristics of an Agile project. Then use these criteria to assess the Agile part of the project over time.

- Develop a methodological approach to searching the literature to more efficiently collect relevant articles in this research area.

- Consider fairly quickly how to solve the timeboxing problem. In particular, being able to bring the team together at certain key times per sprint if the group members belong to and continue to work for different departments (and therefore have managers with their own priorities). It should be as seamless as possible. Otherwise the duration of the sprints will be variable and this will cause confusion and inefficiency.

- Bring more information and especially concrete results of projects conducted in an Agile mode to the leaders (both top and middle management). Three elements may lead them to think that this Agile approach is not adapted to the police organization: it originally came from the IT domain, it was comparatively still little used outside this domain, it was essentially implemented in the private sector.

Conclusion

Starting from the desire of companies to improve their product manufacturing process in order to make them more competitive, the Agile approach ended up in the IT field where a series of alternative methodologies for software development project management were invented. This has led to the development of an Agile manifesto to unify the underlying values and fundamental principles. The approaches that claim to be based on this manifesto have continued to be more widely applied in the software engineering field. Seeing that it obviously worked quite well, other fields of expertise sought to draw inspiration from it to apply this Agile approach in their own sector.

In this thesis, we wanted to articulate the following path. First, we tried to identify what led to the craze for Agile when there were other ways to manage a project. Then, noting a propensity to see Agile extend beyond the purely IT domain, it is interesting to note the other sectors where we have observed a desire to implement Agile and in what way.

From the observations drawn from these implementations, we have restructured the elements that can be put forward as being favorable to the implementation of Agile, especially in a domain outside IT. Indeed, from the moment one seeks to implement Agile, one might as well know what to pay attention to in order to increase the chances of success. Or, from another point of view, to consciously give up leading a certain project if the environment is not suitable. Remember that Agile is a way of managing a project that is not a universal panacea.

From the moment you start or deepen an Agile approach, it can be interesting to measure in which proportion the project is led in an Agile way. This allows us to be more precise and nuanced in what works well or not so well. In a perspective of continuous improvement, it is necessary to use criteria that are relatively constant over time in order to consider comparability over the long term. It is therefore useful to have a model capable of qualifying the components of an Agile operation. This allows each organization to make them their own and develop a metrics model.

Finally, an experimentation of Agile in an unexpected sector was initiated. Although this could not be analyzed at length over time, we were at least able to demonstrate that it is possible to conduct a project in an Agile manner not only in a public sector that is very specific in its missions, the

police, but also in the context of a process of elaboration and execution of a security policy, which is a use case that we did not see anywhere during our review of scientific literature.

It is therefore *a priori* possible to implement an Agile approach in a wide variety of sectors and types of projects. This does not mean, however, that one should do so. We do not claim that Agile is the best way to manage a project. But it could be, even for projects that have been run the same way for years. The best way to know is to test...

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Appendices

Benefits of Agile as found in the literature review

In our literature review, the authors mentioned a series of advantages made possible through the adoption of an Agile approach.

- "*The benefits of agile method deployment are reported in the literature as a faster and more adaptive response to changing customer needs, better integration of the voice of the customer, better team communication, improved development productivity, and faster time to market*" [26, p.1104].

- "*Agile organizations are capable of facing uncertainty by flexibly and quickly responding to market opportunities through the identification of customers' real needs, which are often non-explicit, latent, or even unconscious. However, this speed is not to the detriment of organizational stability. Agile firms are both quick reactors and stable organizations*" [26, p.1102].

- "*95% of respondents reported on at least some of their agile projects having been successful with 48% reporting that most or all of their agile projects were successful. Organizations indicated the three measures of success for Agile transformations that have remained the same over the last few years (Customer/user satisfaction, Business value and On-time delivery)*" [36, p.724].

- "*It is possible to significantly simplify the work on the project and learn how to manage it, thus increasing the efficiency of the team, using the flexible project management system called Agile*" [36, p.716-717].

- "*The most important advantage of Agile is its flexibility and adaptability. It can adapt to almost any conditions and processes of the organization. This is what determines its current popularity and the high number of systems in different areas that have been created on its basis*" [36, p.717].

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- "*Increasing employee motivation after switching to Agile exceeds expectations regardless the industry or the company's experience in Agile*" [36, p.719].

- "*Regardless of their experience in Agile, companies improve the transparency of project management*" [36, p.719].

- The top 5 achievements in software development companies are considered to be the followings: enhanced ability to manage changing priorities, improved project visibility, enhanced delivery predictability, accelerated product delivery, improved team morale [36, p.719].

- "*The development cycle is scaled down to produce a smaller working product in a shorter amount of time*" [29, p.43].

- "*By approaching development incrementally and delivering an increment of system capability, say every few months, the rework cycles are dramatically shortened*" [29, p.43].

- "*By taking people out of their functional silos and putting them in self-managed and customer-focused multidisciplinary teams, the agile approach is not only accelerating profitable growth but also helping to create a new generation of skilled general managers*" [49].

- "*It provides higher quality results and [...] the final products meet the desires (and not only the requirements) of the client significantly better* [53, p.53].

- "*The very core of being agile is adapting to change. In Agile, change is introduced actively into the project, including changes to the product specifications, but in a controlled way and without disrupting the pace or rythm of the project team*" [16, p.6].

- "*[Agile project management] places customers at the highest priority and primarily focuses on the customer experiences. While [traditional project management] approach has shortcomings when used in high-uncertainty projects, [agile project management] provides great flexibility and adaptative short delivery of project outputs*" [21, p.279].

Agile culture development matrix

AGILE CULTURE DEVELOPMENT MATRIX

Level	Purpose and Results (PR)	Agile Leadership (AL)	Well-being and Fulfilment (WF)	Collaboration and Autonomy (CA)	Trust and Transparency (TT)	Adaptability to Change (AC)
Transformational	A compelling, game-changing vision drives a passion to deliver	Leaders are selfless, supporting the needs of today and the vision of tomorrow	People achieve and are fulfilled at work and are vocal ambassadors for the organisation	A network of collaborative teams deliver change with an appropriate level of autonomy	Honesty, transparency and security allows knowledge sharing	Challenges sought with ideas rapidly tested. A strong operational core supports innovation
Thriving	Individual and team goals aligned to clear, long-term customer focused vision	Leaders take responsibility for their actions, admit personal limitations and act on feedback	People feel valued with a good work-life balance, sometimes over-loaded but don't feel threatened	Cross functional collaboration 'the norm' with cases of successful autonomous teams	Generally open and honest but under pressure old behaviours resurface, undermining trust	Reactive change is well managed and implemented although there is a tension with operational needs
Secure	Some alignment of targets with goals incorporating customer value	Leaders are task focused. They engage in discussion to obtain buy-in not genuine feedback	People enjoy working with colleagues and are active in decision making but don't always feel valued	Tensions between business as usual & improvements; responsibilities still functional & hierarchical	Most managers and peers trusted but decisions made behind closed doors	Small changes are managed in process; larger ones often imposed and therefore resisted
Stabilising	Predominantly Financial or Functional targets set with little alignment or buy-in	Leaders are authoritative and give orders but do not inspire	People keep their heads down and focus on delivering work to get paid	Functional silos exist with people tasked to deliver objectives rather than the common good	People don't feel valued and see some managers as manipulative. Information is not readily shared	There is a view 'if it is not broken don't fix it' so change is limited and seen as a risk
Surviving	Changes in direction and priorities are chaotic	Leaders prioritise fire-fighting and personal status	People feel demotivated and disengaged and cover up mistakes	Crisis mode prevails with unclear responsibilities and conflicting orders	A culture of everyone for themselves and knowledge is power so not shared	Changes are chaotic and uncoordinated, driven by immediate pressures

Figure 7.1: Agile culture development matrix (from the Agile business consortium) adapted by Barroca et al. (2019)

Agile computational thinking process

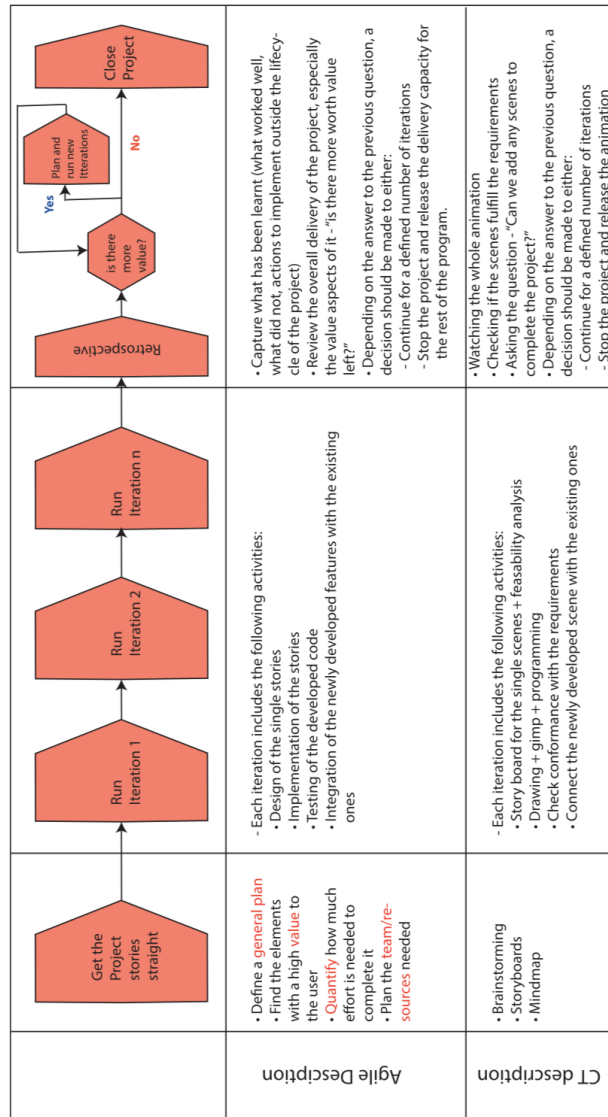|	Get the Project stories straight	Run Iteration 1	Run Iteration 2	Run Iteration n	Retrospective → is there more value? — Yes → Plan and run new iterations / No → Close Project

Agile Description	• Define a general plan
	• Find the elements with a high value to the user
	• Quantify how much effort is needed to complete it
	• Plan the team/resources needed
		- Each iteration includes the following activities:
		• Design of the single stories
		• Implementation of the stories
		• Testing of the developed code
		• Integration of the newly developed features with the existing ones
					• Capture what has been learnt (what worked well, what did not, actions to implement outside the lifecycle of the project)
					• Review the overall delivery of the project, especially the value aspects of it - "is there more worth value left"
					• Depending on the answer to the previous question, a decision should be made to either:
					  - Continue for a defined number of iterations
					  - Stop the project and release the delivery capacity for the rest of the program.

CT description	• Brainstorming
	• Storyboards
	• Mindmap
		- Each iteration includes the following activities:
		• Story board for the single scenes + feasability analysis
		• Drawing + gimp + programming
		• Check conformance with the requirements
		• Connect the newly developed scene with the existing ones
					• Watching the whole animation
					• Checking if the scenes fulfill the requirements
					• Asking the question - "Can we add any scenes to complete the project?"
					• Depending on the answer to the previous question, a decision should be made to either:
					  - Continue for a defined number of iterations
					  - Stop the project and release the animation

Figure 7.2: Mapping Agile development process against computational thinking development process (Fronza et al., 2017)

Interministerial note PLP 58

Below is the interministerial note PLP 58 (in French) on the procedure for submitting zonal security plans 2020-2025 and their approval by the Ministers of the Interior and Justice [23].

A Mesdames et Messieurs les Bourgmestres
A Mesdames et Messieurs les Chefs de Corps de la Police Locale

POUR INFORMATION :
A Messieurs les Procureurs Généraux,
A Monsieur le Ministre-Président du Gouvernement de la Région de Bruxelles-Capitale,
A Madame et Messieurs les Gouverneurs de Province,
A Monsieur le Commissaire-général de la Police Fédérale
A Monsieur le Président de la Commission permanente de la Police Locale,

Votre correspondant	T	Vos références	Annexes
Pierre THOMAS	02 557 35 84		2
Christel DE CRAIM	02 542 79 36		
E-mail	F	Nos références	Bruxelles
SLIV@ibz.fgov.be	02 557 35 88		
secretariatDSBSPC@just.fgov.be			

Circulaire interministérielle PLP 58 relative à la procédure de dépôt des plans zonaux de sécurité 2020-2025 et de leur approbation par les Ministres de l'Intérieur et de la Justice.

1. OBJET

La présente circulaire découle des articles 35 à 37bis de la Loi du 7 décembre 1998 organisant un service de police intégré, structuré à deux niveaux (LPI). Cette circulaire précise la procédure d'introduction des plans zonaux de sécurité 2020-2025 (PZS) (établis tous les six ans conformément à la loi du 16 août 2016 modifiant la loi susmentionnée et entrant en vigueur le 1er janvier 2020) et leur approbation par les Ministres de l'Intérieur et de la Justice.

Elle remplace et abroge la circulaire PLP 50 du 17 septembre 2013.

2. CONTENU DE BASE DU PLAN ZONAL DE SECURITE

Comme le précise l'article 36 de la LPI, le plan zonal de sécurité comprend :

1) Les missions et objectifs prioritaires déterminés par les bourgmestres et le procureur du Roi, chacun en ce qui concerne ses compétences, qui sont intégrés dans une approche globale de la sécurité ainsi que la manière dont ces missions et objectifs seront atteints;

2) La capacité de la Police Locale destinée à l'exécution des missions de police judiciaire et de police administrative et qui doit permettre que l'exécution de ces missions puisse être assurée en tout temps, en particulier les missions locales;

3) La contribution de la Police Locale à l'exécution des missions à caractère fédéral comme visées à l'article 61 de la LPI ;

4) Les missions et objectifs particuliers à une commune de la zone, qui correspondent à une intervention budgétaire de cette commune dépassant la dotation convenue conformément à l'article 40, alinéa 3.

3. PRINCIPES DE BASE DU PLAN ZONAL DE SECURITE

Au départ de ce contenu de base, le PZS vise la planification et la mise en œuvre de la politique policière locale, en particulier avec le(s) bourgmestre(s) et les procureurs du Roi. La Police Locale assure la gestion des événements et des phénomènes locaux en luttant contre la criminalité et en améliorant le sentiment de sécurité de la population[1]. Pour ce faire, la Police Locale applique les principes de la police axée vers la communauté, dont les piliers constituent le cadre de référence de la police intégrée[2].

La Police Locale développe à cette fin des partenariats avec d'autres acteurs au sein de la chaîne de sécurité et avec un large éventail de partenaires locaux au sein du paysage institutionnel de la zone de police, de la vie communautaire et des mouvements citoyens organisés. Un contact direct avec les partenaires et les citoyens permet à la Police Locale de mieux concilier son propre fonctionnement à leurs attentes légitimes et d'aborder les difficultés détectées selon une approche de type « résolution de problème », avec à la clé, des solutions claires et durables. En s'appropriant les problèmes locaux et en interagissant avec les parties prenantes, la Police Locale adopte une attitude d'implication capable. La recherche des moyens permettant de faire participer toutes les parties concernées de la manière la plus indiquée constitue un défi et est cruciale pour le positionnement de la Police Locale dans un contexte de diversité toujours croissante.

Ce faisant, la Police Locale contribue à créer un environnement sûr et à augmenter le sentiment de sécurité de la population. Ce sont ces finalités qui doivent guider la rédaction du PZS et, partant, la détermination de ses objectifs stratégiques et opérationnels. Par la traduction systématique des objectifs stratégiques dans des missions opérationnelles tout au long du cycle de politique et par le suivi permanent des développements et des résultats au niveau local, la Police Locale restera attentive à sa gestion de la situation et pourra justifier correctement de l'ensemble de ses prestations.

La société évolue à un rythme rapide. La numérisation croissante, le développement technologique, la polarisation et la diversité entraînent, entre autres, des changements dans la manière dont les problèmes sociétaux ou la criminalité s'expriment, à la fois dans la vie réelle et dans la réalité virtuelle. Ces évolutions confrontent la Police Locale à de nouveaux défis, dans des domaines tels que la communication (par exemple, l'utilisation des médias sociaux), la recherche et la collecte de la preuve ou l'innovation. Les phénomènes de sécurité présentent de plus en plus des ramifications ou une dimension internationales, comme c'est par exemple le cas pour la cybercriminalité ou le terrorisme, dont les effets et les conséquences peuvent être ressentis au niveau local. La Police Locale joue un rôle de premier plan dans ces évolutions sociétales et assure au citoyen un environnement sûr et habitable.

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[1] Cf. art. 3 de la LPI

[2] Cf. les circulaires CP 1 à CP 4 concernant la définition de l'interprétation du Community policing applicable au service de police intégré

4. CADRE DE TRAVAIL

Les choix stratégiques de la politique policière au niveau local sont déterminés par le conseil zonal de sécurité (art. 37 de la LPI). Si le conseil zonal de sécurité doit veiller à la cohérence entre le PZS et les priorités fédérales en matière de sécurité, il est évident que la sécurité locale est très importante pour la détermination des priorités. C'est avant tout la situation locale et les problèmes de sécurité identifiés et signalés par la police, les partenaires et/ou la population qui doivent servir de lignes directrices pour l'élaboration du PZS.

En exécution de l'article 36 de la LPI (en ce compris les aspects relatifs à la capacité de la Police Locale), il nous paraît essentiel que le PZS soit constitué de deux parties :

-   La planification stratégique qui comprend les options planifiées pour le cycle de 6 ans, découlant d'un scanning et d'une analyse de l'environnement et de l'organisation elle-même;
-   La mise en œuvre de la politique avec l'opérationnalisation de cette planification stratégique via les plans opérationnels annuels ou via une forme plus flexible de mise en œuvre.

Cette forme plus flexible de mise en œuvre et de suivi de la politique policière est laissée à l'appréciation de chaque zone de police, tout comme son rapportage auprès des conseils zonaux de sécurité (par exemple par le biais de réunions de suivi périodiques).

4.1. La planification stratégique

En ce qui concerne la première partie, nous encourageons les conseils zonaux de sécurité et les chefs de corps à réaliser un diagnostic stratégique qui commence par un scanning, d'une part de l'environnement (local) en vue de déterminer son image en termes de sécurité et de qualité de vie et, d'autre part, de l'organisation elle-même, étant donné que le contexte interne et les processus de gestion sont essentiels pour pouvoir mettre en œuvre la stratégie choisie.

Le PZS établit la politique policière pour la période 2020-2025. Le cycle de gestion du PZS prévoit l'évaluation de l'ancien PZS comme point de départ pour l'élaboration du nouveau PZS. Néanmoins, il est également essentiel, partant du concept de sécurité intégrée, d'anticiper et de tenir compte des tendances futures qui sont déjà identifiées au niveau local et qui peuvent avoir une incidence sur la politique de sécurité locale. Les attentes des différentes autorités de tutelle (locales, supra locales, régionales, etc.) et celles des partenaires vis-à-vis de la Police Locale doivent également être établies.

La structure de l'organisation policière elle-même joue également un rôle important dans l'élaboration de la future politique policière. La manière dont l'organisation est structurée et pilotée afin d'atteindre les objectifs fixés pour davantage de sécurité et de qualité de vie ne doit pas être perdue de vue.

Partant de l'analyse de l'environnement interne et externe et de l'analyse des problèmes et des attentes qui y ont été détectés, une vision stratégique peut être énoncée pour le cycle de gestion à venir, dont découlent des objectifs stratégiques, éventuellement des objectifs tactiques et, dans tous les cas, des objectifs opérationnels.

Pour que le PZS réponde aux principes et objectifs susmentionnés, il comprend au moins les éléments suivants :

- Une analyse de la situation locale ;
- Les Mission, Vision, Valeurs ;
- Une analyse des attentes des partenaires ;
- Une matrice stratégique (choix des priorités et objectifs stratégiques).

4.2. La mise en œuvre de la politique

Le contexte sociétal actuel, caractérisé par un degré d'incertitude élevé, des changements rapides et un haut degré de complexité, crée le besoin d'une plus grande flexibilité dans la mise en œuvre de la politique policière. Des événements perturbateurs et des évolutions rapides des tendances en matière de criminalité et la nécessité de saisir les nouvelles opportunités de développement organisationnel et d'innovation ont pour conséquence que tout ne peut pas toujours être repris dans des plans stricts fixés des mois, voire des années à l'avance. En ce qui concerne la mise en œuvre du plan zonal de sécurité, nous vous demandons dès lors d'intégrer une certaine flexibilité dans la gestion de ce plan. En prévoyant un volet "mise en œuvre de la politique policière", le choix pour des plans d'action opérationnels traditionnels ou une manière plus flexible de suivi des choix politiques posés peut être argumenté et expliqué.

Le conseil zonal de sécurité prépare et évalue la mise en œuvre du PZS (Art.35 van de LPI). Si le choix est fait pour un suivi plus flexible de la politique définie, il incombe au chef de corps d'informer le conseil zonal de sécurité de la manière dont le PZS sera appliqué, ainsi que de prévoir un rapportage systématique de la mise en œuvre du PZS et ce, au minimum, une fois par an. Il est, en outre, recommandé que, dans le cadre de cette mise en œuvre, le chef de corps informe également le conseil de police de l'état d'avancement des objectifs et des actions formulés.

4.3. Alignement du plan zonal de sécurité avec la stratégie nationale et régionale

Les plans zonaux de sécurité s'inscrivent également dans un cadre stratégique plus large. Avant tout, il est prévu un alignement avec le Plan National de Sécurité (PNS), conformément à l'art. 37 de la LPI. Le PNS actuel 2016-2019, qui est par ailleurs lui-même aligné sur l'actuelle Note-Cadre de Sécurité Intégrale 2016-2019 (NCSI), expire le 31 décembre 2019. C'est la raison pour laquelle la possibilité vous est offerte de soumettre, via la fiche d'analyse en annexe, des suggestions par rapport aux phénomènes de sécurité et/à d'autres thèmes qu'il vous semble essentiel de retrouver dans les futurs plans de gestion nationaux. Il s'agit des sujets qui selon vous, en votre qualité d'expert dans le domaine de la sécurité intégrale, doivent être traités au niveau supralocal. Sur la base de cet apport, le SPF Intérieur rédigera un rapport et le soumettra aux ministres de tutelle. Complémentairement à l'image nationale de sécurité, ce rapport constituera une source pour la préparation de la NCSI et du PNS.

Pour l'alignement du PZS sur le nouveau PNS 2020-2023, une fiche vous sera envoyée. Par le biais de celle-ci, vous ferez mention des thèmes nationaux auxquels vous contribuerez dans votre zone.

S'agissant de la traduction du PNS et de la réalisation et du suivi des PZS, la Police Fédérale assure, en fonction des demandes des zones de police et compte-tenu de ses possibilités, un rôle de facilitateur et de coordonnateur.

Par ailleurs, un alignement des plans zonaux de sécurité des six zones de police bruxelloises avec le plan régional de sécurité est requis (art. 37bis WGP). Les zones de police de l'arrondissement administratif de Bruxelles-Capitale tiennent donc compte du plan global de sécurité et de prévention (PGSP) lors de la rédaction de leur PZS 2020-2025.

5. CADRE D'APPROBATION

5.1. Ligne du temps

Conformément à l'article 37, §3 de la LPI, le plan zonal de sécurité sera soumis, après approbation par le conseil zonal de sécurité, à l'approbation des Ministres de l'Intérieur et de la Justice selon le calendrier suivant :

Période	Activités
Dès à présent – septembre 2019	*Scanning et analyse* *Elaboration du plan zonal de sécurité et approbation au niveau local*
01/10/2019 au 31/10/2019	*Soumettre le plan zonal de sécurité à l'approbation des Ministres de l'Intérieur et de la Justice*
01/01/2020	*Exécution du plan zonal de sécurité.*

5.2. Modalités pratiques d'introduction du plan zonal de sécurité

Conformément à l'article 37, §3 de la LPI, le délai d'approbation des Ministres de l'Intérieur et de la Justice est de 2 mois (éventuellement augmenté d'un mois en cas de non-approbation du plan initial). Le Plan Zonal de Sécurité doit donc être soumis à la Direction Générale Sécurité et Prévention (DGSP) **au plus tard** le 31 octobre 2019. La mise à exécution des plans doit pouvoir intervenir dès le mois de janvier 2020.

Le chef de corps envoie le plan zonal de sécurité, ainsi que les fiches requises ci-dessous, selon un **mode unique**, à la DGSP. Il s'agira d'une plateforme Sharepoint dont l'adresse vous sera communiquée ultérieurement.

Le délai d'approbation commence à courir uniquement lorsqu'il est satisfait aux conditions suivantes :

1) Le plan doit être signé au minimum par le(s) bourgmestre(s) et le Procureur du Roi ;
2) La fiche d'analyse complètement remplie et signée par le chef de corps doit être transmise par celui-ci à la DGSP (par mail : SLIV@ibz.fgov.be);
3) Le Procureur du Roi transmet la check-list entièrement complétée et signée (cf. annexe) au Service de la Politique criminelle de la DG Législation du SPF Justice et ce par courriel à l'adresse : SecretariatDSBSPC@just.fgov.be).

Le format ou les modèles de PZS sont laissés au libre choix des zones de police. Des modèles de documents, pour votre inspiration, sont mis à votre disposition sur le site besafe, à la page relative au plan zonal de sécurité.

5.3. Procédure d'approbation

Une fois le PZS déclaré recevable, un **accusé de réception** sera systématiquement envoyé par la DGSP par courrier au président du Conseil Zonal de Sécurité et par mail au chef de corps.

Si le PZS n'est pas jugé recevable, le président du Conseil Zonal de Sécurité en sera averti par courrier afin qu'il soit remédié aux manquements. Ce courrier ne fait pas courir le délai d'approbation.

En vertu de l'article 37, §3 de la LPI, les Ministres de l'Intérieur et de la Justice se prononcent dans un délai de deux mois à compter de l'envoi de l'accusé de réception. Passé ce délai, leur approbation est réputée acquise.

Si les Ministres de l'Intérieur et de la Justice n'approuvent pas le PZS, une nouvelle version de celui-ci leur est soumise dans un délai d'un mois. Dans ce cas de figure, le délai pour l'approbation est ramené à un mois.

Tant la fiche d'analyse que la check-list sont des documents qui ont pour finalité de soutenir la décision d'approuver ou non le PZS en ne constituent pas le PZS. La check-list ne sera pas diffusée. La fiche d'analyse est téléchargeable sur le site web besafe (page relative au PZS). La check-list est mise électroniquement à la disposition de tous les procureurs du Roi.

6. EVALUATION ET ADAPTATION DES PZS

Les zones s'engagent à organiser un conseil zonal de sécurité annuel dédié au suivi du plan zonal et à l'évaluation des résultats des plans d'action ou des résultats obtenus par le moyen de la gestion plus flexible de mise en œuvre de la politique policière.

Des adaptations au PZS et aux plans d'action opérationnels peuvent être apportées en cours d'exécution du plan zonal de sécurité, et ce, en fonction des réalités locales.

Vous porterez à notre connaissance, suivant la procédure susmentionnée (cf. point 5.2), les modifications qui touchent au PZS et à la fiche d'analyse. En d'autres termes, vous transmettrez les modifications à la Direction Générale Sécurité et Prévention à l'adresse indiquée supra.

La check-list du Procureur du Roi est uniquement utilisée pour la procédure d'approbation. Si le PZS est modifié, aucune nouvelle check-list n'est requise.

En cas de modification de l'échelle de la zone, le cadre réglementaire, notamment l'article 91/8 de la LPI, sera respecté.

Sincères salutations,

Koen GEENS
Ministre de la Justice

Pieter DE CREM
Ministre de de la Sécurité et de l'Intérieur

Extract from a zonal police policy plan

Below is an excerpt of the original zonal security plan (in French) that the Condroz-Famenne police zone has put on its website [20]. This extract announces the main themes of the follow-up of the security policy that will be undertaken for the next 6 years.

4 Politique et gestion

4.1 Approche des priorités stratégiques : du plan d'action à une activité économique flexible

4.1.1 Evaluation du plan zonal de sécurité 2014-2019

Les priorités figurant dans le plan zonal précédent visaient les cambriolages, l'insécurité routière, les incivilités et le développement des compétences des collaborateurs. Les trois premiers objectifs stratégiques ont donné lieu à des plans d'actions totalisant 45 actions, dont 11 ont été réalisées conformément aux prescriptions et 32 ont été menées mais à une fréquence inférieure à celle souhaitée initialement. Le développement des compétences a imprégné le service des ressources humaines mais n'a donné lieu à aucun plan d'actions formalisé conformément à la méthodologie imposée par la circulaire PLP 50. Enfin, certaines thématiques ne constituaient pas des objectifs stratégiques en tant que tels mais figuraient tout de même parmi les points d'attention particulière, à savoir la lutte contre les stupéfiants, la prise en compte des recommandations de l'étude relative à la charge psychosociale réalisée par notre partenaire dans le domaine du service externe de prévention et de protection au travail et la prise en compte des conclusions de l'analyse du fonctionnement du corps de police.

L'évaluation du plan zonal antérieur est globalement positive. Bien que nous n'ayons pas pu couler sous forme de plans d'actions la totalité des objectifs stratégiques énumérés, nous avons pu mener la grande majorité des actions prévues dans le cadre des trois autres priorités, bien qu'à défaut de la fréquence désirée. Rappelons toutefois que notre zone de police fonctionne correctement pour gérer le travail quotidien, mais nous ne disposons pas suffisamment de ressources pour mener des actions ou projets ambitieux. Ainsi, moins de 2% de la capacité étaient disponibles pour exécuter les actions prévues.

Nous n'avons reçu aucune remarque particulière du SPF Intérieur. Néanmoins, nous soutenons depuis longtemps un allègement méthodologique. En effet, la définition d'objectifs stratégiques, de plans d'actions, leur évaluation, les réunions du conseil zonal de sécurité, etc. consomment du temps et n'est pas une manière réactive d'aborder les phénomènes d'insécurité qui peuvent survenir à tout moment. Il s'agit d'un modèle dit « en cascade », méthodologiquement lourd et fort statique. Heureusement, la circulaire PLP 58 offre enfin plus de latitude quant à la manière d'aborder la mise en œuvre de la politique.

4.1.2 L'équipe de suivi de la politique

Le porteur principal de la politique est naturellement le chef de zone. Il est toutefois assisté par ses directeurs de départements ainsi que par un analyste stratégique. Un comité de direction se réunit

chaque semaine et le suivi de la politique trouvera naturellement siège lors de cette réunion rassemblant les protagonistes évoqués précédemment.

4.1.3 Monitoring de la mise en œuvre de la politique

4.1.3.1 En théorie

Si les priorités du plan zonal de sécurité actuel sont évidemment figées ou amendées par le conseil zonal de sécurité, la mise en œuvre de celles-ci sera beaucoup plus souple que précédemment sur le plan méthodologique. Plutôt qu'une approche statique passant par la rédaction de plans d'actions prédictifs et rigides, nous privilégions une approche « agile » offrant beaucoup plus d'adaptabilité et de pragmatisme. Toutefois, si l'on devait faire le constat que cette méthodologie ne trouve pas à s'appliquer conformément à nos espérances, nous en reviendrons à une méthodologie traditionnelle « en cascade » comme réalisée lors des précédents cycles de gestion du plan zonal de sécurité.

L'approche « agile » de gestion de projet n'est pas « la dernière mode » dans la mesure où les prémices de la philosophie à sa source remontent aux années 1960. Elle a été fortement développée dans les années 1990 et a conduit à un « manifeste pour le développement agile de logiciels » en 2001. Comme son intitulé le laisse penser, cette manière de gérer les projets visait initialement le champ des nouvelles technologies. Ce manifeste succinct tient ces propos :

« Nous découvrons comment mieux développer des logiciels par la pratique et en aidant les autres à le faire. Ces expériences nous ont amenés à valoriser :

- *Les individus et leurs interactions plus que les processus et les outils*
- *Des logiciels opérationnels plus qu'une documentation exhaustive*
- *La collaboration avec les clients plus que la négociation contractuelle*
- *L'adaptation au changement plus que le suivi d'un plan*

Nous reconnaissons la valeur des seconds éléments, mais privilégions les premiers. »[11]

Toutefois, les principes sous-jacents sont adaptables à d'autres fins. On parle d'ailleurs de plus en plus de « management agile » dans la réalité globale d'une organisation et non limitée à la seule conduite de projets.

Une démarche projet selon la philosophie agile vise un découpage du travail à effectuer selon un cycle itératif et incrémental qui peut être représenté sobrement par le diagramme suivant.

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[11] https://agilemanifesto.org/iso/fr/manifesto.html

Chaque boucle représente une itération, c'est-à-dire une charge de travail destinée à atteindre les objectifs définis avant d'entamer ladite boucle. Le temps que l'on passe dans cette boucle est normalement relativement court (1 à 4 semaines). L'ambition des objectifs définis doit dès lors être raisonnable. Toutefois, dans notre cas, il n'y aura certainement pas d'équipe projet dévolue à temps plein à celui-ci, les membres du personnel déterminés s'y consacrant en marge de leur travail quotidien. Il serait donc sensé d'augmenter la durée du cycle ou de réduire encore la portée des objectifs définis. Quoiqu'il en soit, au terme de la boucle, on fait le point et on redéfinit des objectifs (nouveaux ou affinement des existants) à atteindre au terme de la boucle suivante. Au fil des itérations, on affine de plus en plus ou rectifie l'objectif qu'on s'était fixé au tout début. En ce sens, le processus est incrémental puisqu'on améliore le produit au fil des itérations. L'avantage d'adaptabilité d'une méthodologie agile provient de la réaction rapide à tout changement inattendu venant bouleverser le projet. Entre chaque cycle, on adapte l'objectif au contexte, aux ressources dont on dispose pour le cycle à venir, aux événements imprévus venant de surgir,…

Chaque cycle est découpé en segments de couleur. Chaque couleur détermine une charge métier différente (en termes fonctionnels, pas quantitatifs). Autrement dit, chaque couleur détermine sous l'œil de quel type de professionnel il faut passer. Par exemple, dans le cadre du développement d'un logiciel en informatique, on cite notamment la planification, l'analyse, la programmation, les tests,… Chaque approche étant réalisée par un spécialiste du domaine. On pourrait reprocher au diagramme présenté le fait que chaque segment de couleur possède la même longueur dans chaque boucle. En réalité, chaque acteur s'investit différemment selon les objectifs déterminés en début de boucle. La charge de chaque professionnel varie donc de boucle en boucle (par analogie avec l'informatique, selon l'état d'avancement, on aura besoin de beaucoup de tests à certains moments, moins à d'autres).

4.1.3.2 En pratique

Il n'y a pas, à notre connaissance, de transposition de la méthodologie « agile » à la fois pour des projets potentiellement autres qu'ICT en conjonction avec une application à la police en général (et encore moins à une zone de police dont le fonctionnement diffère pour chacune). Convaincus par les avantages offerts par une telle méthodologie, nous avons donc l'ambition de parvenir à l'adapter au fonctionnement de notre corps de police. Comme toute transformation, cela passera par des essais et ajustements. Cette manière de fonctionner avec souplesse, et singulièrement « l'adaptation au changement », est d'ailleurs mis en avant par le manifeste évoqué précédemment. Ce qui va suivre

consiste donc en l'amorce de l'application d'une méthodologie « agile » pour assurer le suivi du plan zonal de sécurité. Il est possible et même probable que des adaptations seront opérées avec le temps.

Un *momentum* dans le cadre du comité de direction sera prévu pour faire le point sur le suivi de la politique annoncée. Notre analyste stratégique, qui en est membre, se chargera du suivi et de l'accompagnement méthodologique.

Avant de débuter le premier cycle, une liste d'objectifs concrets à atteindre par priorité du PZS sera constituée (dénommée généralement « backlog » dans le jargon). Conformément à la philosophie d'adaptabilité de la démarche, cette liste est susceptible d'évoluer dans le temps (affinement, nouvel événement,…). Il n'est donc pas nécessaire de s'obliger à « penser à tout » dès ce moment. Pour chaque objectif, il s'agit idéalement de cibler le produit/service final désiré et parvenir à l'exprimer sous la forme d'un besoin à satisfaire, tel que « *en tant que <rôle>, je souhaite <action> afin de <raisons/justification>.* »

Une fois cette liste constituée, un niveau de priorité est donné par le comité de direction à chacun de ces objectifs et va déterminer l'ordre dans lequel ils seront pris en charge. Pour chaque objectif, une petite équipe pluridisciplinaire concernée par l'objectif sera constituée (maximum six personnes). Le comité de direction détermine quels « profils » (en tout ou en partie) doit réunir cette équipe, selon la spécificité de l'objectif, ou considère par défaut que chaque équipe doit réunir un membre de chaque direction pour s'assurer d'avoir un représentant de chaque spécialité. On part du principe que l'équipe, dont les membres sont concernés directement ou indirectement par la thématique en jeu, est la mieux à même de déterminer comment apporter une solution satisfaisante au besoin que l'on cherche à satisfaire. Par ailleurs, la composition d'une équipe transversale contribue à décloisonner les services. Un appel à volontaires sera ensuite opéré au sein de chaque direction afin de remplir ces profils.

L'équipe constituée dispose de la durée d'une itération (une boucle) pour mener à bien l'objectif. La première réunion vise, d'une part, la détermination précise du produit attendu, conformément aux besoins et contraintes relevés par les membres de l'équipe et, d'autre part, le découpage de l'objectif en tâches qui, mises bout à bout, permettent d'atteindre celui-ci. Chaque tâche ne doit pas dépasser une charge quantitative de travail supérieure à quelques heures. Une fois les tâches déterminées, chaque membre de l'équipe choisit celles dont il va se charger. A la fin du cycle (boucle), les membres de l'équipe sont censés avoir terminé leurs tâches respectives. Des rencontres régulières doivent être tenues afin de suivre l'évolution de l'accomplissement des tâches. Dans le cadre d'une équipe qui se consacre à temps plein au projet, une mini-réunion de 10 minutes se tient quotidiennement. Dans notre cas, la réunion sera hebdomadaire et durera environ 30 minutes.

Lors de chaque comité de direction, on fait le point sur la progression de l'objectif. Rien n'empêche plusieurs équipes d'avancer sur plusieurs objectifs en parallèle ou une même équipe sur plusieurs objectifs. Il importe seulement d'être réaliste quant à l'estimation de la charge de travail et du temps dont chaque membre de l'équipe dispose pour avancer sur l'objectif en marge de son travail quotidien (ils restent en effet affectés à leur service d'origine et ne se consacrent pas au projet à temps plein), afin d'éviter de susciter une démotivation aboutissant à l'échec du processus.

Une fois le cycle terminé, on adapte la liste des objectifs en fonction des nouveautés et on recommence le processus décrit précédemment. Pour déterminer si un objectif est atteint, il doit répondre à la définition que désire en donner le comité de direction. Le plus simple étant de considérer qu'un objectif est atteint lorsque l'affirmation exprimée lors de la définition de l'objectif s'applique bel et bien (« *en tant que <rôle>, je parviens à <action> afin de <raisons/justification>* »). Toutefois, on pourrait décider d'assortir cette exigence de critères de qualité supplémentaires (ex : le processus est formalisé dans une procédure connue des membres du personnel, le processus est appliqué depuis un mois sans problème identifié,…).

D'une manière générale, l'entièreté du processus est révisable à (presque) tout moment. Le pragmatisme constitue la force de cette méthodologie, et singulièrement l'attention apportée au fait de contourner les problèmes (mineurs ou majeurs) rencontrés (d'où l'importance des réunions quotidiennes ou hebdomadaires pour les faire émerger). C'est pourquoi la démarche est exécutée sous forme de cycles courts (quelques semaines), afin d'être en mesure de s'adapter avant le début du cycle suivant. En conséquence, la seule limitation à la révision du processus consiste à attendre la fin du cycle en cours.

4.1.3.3 Exemple

Dans le cadre de la thématique de la lutte contre les incivilités, une série d'objectifs sont listés au niveau du comité de direction. Parmi ceux-ci se trouve la prévention des dépôts de déchets en dehors des heures de collecte prévues, qui a été considérée comme prioritaire. La manière d'exprimer l'objectif dépend du ton que l'on cherche à lui donner : préventif, proactif, réactif, informatif, souple, dur,…

Par exemple : « *En tant qu'agent de quartier, je souhaite être informé des poubelles déposées devant les bâtiments de mon quartier, hormis de la veille du jour de la collecte des déchets à partir de 18h jusqu'au moment de la collecte lui-même, afin d'évaluer l'ampleur de la problématique* ». La portée de cet objectif vise donc, à ce stade, la récolte d'informations. Le bénéficiaire de cet objectif est l'agent de quartier. La raison est d'évaluer le problème à ce stade, mais on peut imaginer que d'autres actions (objectifs) suivront selon les résultats qui apparaîtront.

L'équipe devrait être constituée au minimum d'un agent de quartier, d'un statisticien, d'un patrouilleur, mais on pourrait considérer un représentant de chaque direction. Les bonnes idées peuvent en effet survenir de n'importe où. L'équipe va ensuite échanger des idées jusqu'à déterminer le produit final permettant de répondre aux besoins de tous. Par exemple, un espace SharePoint dans lequel se trouvent les adresses des bâtiments où ont été constatés les dépôts illégaux ainsi que le moment de l'observation. Cet espace serait doté d'un filtre permettant à chaque agent de quartier d'accéder facilement aux adresses intéressant le quartier dont il est responsable. L'analyste pourrait élaborer des statistiques globales à l'échelle de la zone de police et avec une évolution temporelle.

Grossièrement, les grandes étapes du processus à mettre en place sont :

1. La construction de l'espace SharePoint en question

2. La prise de photo et des données de localisation par dépôt de sacs poubelles
3. Faire remonter ces informations jusqu'au SharePoint

Différentes tâches auront été déterminées par l'équipe en vue d'atteindre le résultat d'ici la fin du cycle en se posant, par exemple, les questions suivantes. La prise de photo et des données de localisation implique : la mise en place d'un processus (note de service), la mise à disposition de matériel (appareil photo) ou l'acceptance de l'utilisation des smartphones personnels (règlement d'ordre intérieur), la question de savoir si on est en droit de le faire (RGPD),… La constitution de l'espace SharePoint nécessite une réflexion sur les données et métadonnées utiles pour aboutir au résultat escompté, quels utilisateurs doivent pouvoir y accéder et avec quels droits, qu'en est-il de la bande passante si on doit faire transiter des volumes de photos conséquents, comment sont codifiées les données de localisation, pendant combien de temps les données peuvent-elles être conservées,…

Glossary

Agile project management Project management based on Agile philosophy adaptable to any kind of project.

Backlog List of deliverables that should be implemented by the team. It is more a wish-list than a to-do list.

Burn down chart Graphical representation of the work remaining for a given duration, typically illustrated on two axis: the tasks remaining versus the time flowing.

Daily Scrum Also named "the daily meeting" or "the daily stand-up". It is a short (15 minutes) daily meeting where each team member briefly shares information on three topics: what I finished yesterday, on what am I working today, what is preventing me from doing my work. The meeting is used to provide transparency and the possibility to adapt.

Development team Group of people working together to achieve a goal.

Feature Driven Development Software development approach organized around making progress on features, starting from a global perspective.

Fishbowl Alternative facilitation format to plenum discussion in which the participants are seated in two concentric circles. While those in the inner circle are debating, the others are listening and observing but have the possibility to come and replace someone in the inner circle to carry on the discussion.

Kanban board Visual planning allowing each team member to see the global workflow of the different tasks and who is responsible for each task.

KPI A "Key Process Indicator" is a measurable value that demonstrates how effectively an objective is achieved.

MoSCoW Prioritization tool often used when a deadline is established. It is based on four categories: Must have (M), Should have (S), Could have (C) and Won't have (W).

Niko-Niko calendar Calendar allowing "*each team member to record, at the end of every workday, a graphic evaluation of their mood during that day. This can be either a hand-drawn "emoticon", or a colored sticker, following a simple color code, for instance: blue for a bad day, red for neutral, yellow for a good day*" [61].

PMBoK "Project Management Body of Knowledge", a project management reference published by the Project Management Institute (PMI).

Pretotype Stripped-down version of a product, used to merely validate interest. For example a simple website that tracks how many visitors click to subscribe to a proposed service still under elaboration.

Product owner Member of the Agile team who acts as a link between the development team and the client. His or her role is in particular the prioritization of the backlog in defining which tasks should be achieved first.

Prototype Stripped-down version of a product containing more detail than the pretotype. More than just determining whether it meets the interest of consumers, we can estimate to what extent it meets expectations.

Retrospective Internal discussion between the team members about what went badly during the latest iteration and what they could do to improve the next iteration.

ROI A "Return On Investment" is a performance measure used to evaluate the efficiency of an investment.

Scrum board Backlog extraction updated daily showing all items aimed to be achieved in the current sprint. It often uses a kanban format.

Scrum master Member of the Agile team and acting Scrum methodology evangelist who helps both the team and the organization understand Scrum theory and practice. He or she is accountable for the Scrum Team's effectiveness.

Showcases The team demonstrates the work completed during the latest iteration to their customer or stakeholder. This allows the team to receive immediate feedback which they can take into account in the next iteration.

SMART Mnemonic acronym giving criteria to guide in the setting of objectives, *i.e.* Specific, Measurable, Attainable, Relevant, Time-Based.

Sprint Fixed time (generally 1 to 4 weeks) of an iteration in an Agile process set by the team members.

Sprint planning Timeboxed working session in which the team collectively agrees to complete a set of backlog items within the sprint duration.

Story card Short (one or two sentences) description of a product or a project requirement displayed on a (kanban) board.

Team charters Also called "social contracts". It is an agreement between the team members in which the rules, values, behaviours and social norms are collaboratively set and can be revised.

Timeboxing Allocation of a certain amount of time to an activity in advance and then completing the activity within that time frame.

User story Short natural language description of a feature formulated from the perspective of an end user.