



CREATIVE INTELLECT CONSULTING LTD.

CIC Agile Case Study: European Defence Company

Driving quality through the pragmatic implementation of Agile and empowered individuals

Case study at a glance

This case study report investigates the adoption of Agile processes within a provider of defence systems including Aeronautics, Dynamics, Electronic Defence Systems, Security and Defence Solutions, Support and Services. The report looks to chart the journey towards Agile and its progress across the wider organisation.



Bola Rotibi, Research Director, Creative Intellect Consulting
Clive Howard, Principal Analyst, Creative Intellect Consulting
June 2014

Creative Intellect Consulting is an analyst research, advisory and consulting firm focused on software development, delivery and lifecycle management across the Software and IT spectrum along with their impact on, and alignment with, business. Read more about our services and reports at www.creativeintellectuk.com

Forward distribution is forbidden without written consent. If you wish to forward distribute please contact bola@creativeintellectuk.com

Executive Summary

This company's Agile journey began 6 years ago in 2008 and it took a couple of years to include all disciplines. It has now reached a high level of maturity across the organisation. Managers are part of the Agile process with their own teams and are part of the production teams. This has given them a great understanding of the processes and the challenges which has enabled them to constantly improve those processes. The organisation has demonstrated a pragmatic approach to Agile and when and where it is applied. Their pragmatism has been driven through the need to address a wide range of factors. Their application of Agile has been driven more by the manifesto principles than the specifics of a given framework. This has led the company to operate multiple Agile frameworks as well as being able to incorporate V-model and model driven development into their processes. Their aim of improving the quality of the products has been met and this has been essential where strict standards have to be applied within a safety critical industry. In addition they have reaped the benefits of increased communication within teams and between teams and the customer. The results include an improvement in management, shorter delivery times and a more efficient and competitive business.

In charting the organisation's Agile journey this case study looks to ascertain the impact of Agile on the wider delivery lifecycle and the business operational processes. Doing so offers an opportunity to get a better understanding of the role Agile processes and practices can play in supporting other common workflow initiatives such as Lean, which looks at reducing waste in the workflow. The study can serve to provide key lessons in how to apply Agile in order to improve quality.

Agile transformation can be, and was for the organisation, a difficult change for the business and its people but their pragmatic, best fit, approach has brought the overwhelming number of people with them on the journey.

Agile profile at a glance

Agile Achievement	Pragmatic implementation of multiple Agile frameworks within a European aerospace and defence organisation achieving improved quality and empowered individuals.
Agile Experience	Began 6 years ago with all disciplines now included and highly management driven.
Agile Footprint	Very mature processes across the entire organisation.
Agile Drivers	Needed to increase the quality of products but also shorten delivery times and improve business effectiveness and competitiveness.
Agile Gaps	More gathering of metrics is needed to measure the processes and help to optimise them further.
Agile Insights	<ul style="list-style-type: none">● Moving to Agile benefits greatly from being driven by senior management.● Taking a pragmatic approach to Agile and the different implementation frameworks (e.g. Scrum and Kanban), has allowed ways of working that best suits the company.● A strong planning framework involving project managers is beneficial for Agile deployment.● Continuous communication and collaboration internally within the organisation and externally with the customer helps deliver better quality product.

Key findings from this case study

- Professional services/consulting support to help implement organisation-wide Agile transformation was crucial. The value from the consultants' experiences and insights from executing other transformational processes was vital for coordinating the many changes that had to happen (e.g. working patterns, roles, processes) and to ensure regulatory standards and protocols were not breached.
- Bringing in consultants to set up and direct the transformation process can help to distance the negativity that often arises with the initial implementation process from the ongoing operations once the consultants hand over to the internal teams
- Using internal consultants where available offers the benefit of resources that understand the organisation, particularly its culture and operations, allowing them to be more adept in determining the best and most effective change process strategies.
- Not being dogmatic in the application of Agile means that the organisation can apply the approach which best fits the task in hand and the people carrying it out.
- Planning is critical to the success of Agile, especially when addressing the complexities of a large organisation that is globally distributed, multi-disciplined and runs multiple projects at once.
- A solid, 'visual' planning phase not only helps to alleviate friction between different functions, it can provide the necessary higher level insights (e.g. the status of feature requirement) that can often be lost in project with numerous moving parts and short delivery time scales.
- Integration Milestones allow software and hardware teams to collaborate more effectively and according to their delivery speeds within an Agile execution framework.
- An Agile tooling strategy needs to be flexible, appropriately applied and open to growth. Initial tooling support may be focused on delivering a specific return e.g. testing tools for improving product quality, but other tooling support may be justified once the added value of their usage becomes clear.
- Agile process execution frameworks can provide the necessary governance structures to support safety critical businesses. They also require a pragmatic and open approach to employing the right documentation to comply with regulatory policies, which can include employing other assets (e.g. test cases) to demonstrate compliance.
- A contented workforce makes for smoother Agile transformation but having management actively involved within the process strengthens the foundations for cross organisational engagement, collaboration and delivery success.

Business and operational gains

- Improved leadership, better project prioritisation and more empowered delivery teams able to make decisions when required and based on their expertise and experiences
- Better insights into the true costs of the delivery process allowing better management of the pricing models.
- Improved communication and collaboration within the organisation and between all levels of the organisation and its customers resulting in better understanding of the customers' requirements, earlier identification of problems and the delivery of better quality products they actually want.

Case Study in Detail: Agile within a European defence company

Industry Sector

The organisation serves the aerospace and defence industry delivering a range of airborne systems and structures.

Company overview

As a global organisation, serving markets that include defence and civil security, it employs 14,000 people around the world. Their most recent revenues amounted to \$3.6bn, with R&D accounting for 20% of sales. The organisation is divided into multiple business areas, including: Aeronautics, Dynamics, Electronic Defence Systems, Security and Defence Solutions, Support and Services. The primary product areas are air traffic control, aircraft and military systems and radars. The organisation is over 70 years old and is publicly traded on the NASDAQ. The area that we spoke with focuses on the design and development of radar and radar detection systems. Disciplines include software and firmware, electronics, mechanical engineering and safety.

Agile Maturity – the journey and the landscape



For the organisation, a typical project takes a couple of years to bring a product to market (which includes creating a prototype) and that product can have a lifespan of 10 years. At any one time delivery teams will be working on a combination of existing and new products. The company also has the capability to manufacture products internally. In 2008 the organisation realised that it needed to increase the quality of products, especially within software and firmware development. A critical factor for them in achieving this was to increase the amount of testing. The decision to adopt Agile was taken at a senior management level, as they believed this would address these quality concerns. Their intention was to roll Agile out universally across the company.

Such was the level of commitment that there were even some Agile teams consisting solely of managers. This way everyone got to experience the Agile methodology and processes. For the company it was an interesting way to

address the Agile principle of not having a hierarchy, which is challenging in an organisation that requires hierarchy. The approach of putting management into Agile teams does not do away with the organisational structure, but does give everyone the same experience and processes to work within. In a sense, this makes everyone equal.

The Agile transformation took a couple of years to bring all disciplines within the methodology and it is now the only way of working. However, not all teams follow the same Agile implementation, with a mix of Agile implementation methodologies (Scrum) and Lean planning practices (Kanban) being applied, even within a single discipline.

Process Heritage



Historically, the organisation had followed traditional development methodologies, such as Waterfall and V-model. The processes and culture were therefore tailored to long design and development cycles.

Agile Execution



Professional help was key to driving through the changes needed

It was recognised from the beginning that the organisation would need help with such a significant transformation program. They were changing working patterns, roles and processes across the company, a task which required major restructuring. This was within an environment that had strict regulations and standards to adhere to, given the safety critical nature of the work and output. Fortunately, a function of the business was consulting and within that there was Agile expertise. As a result, the company was able to use its own consultants to implement the transformation.

This had a couple of benefits, the first being that internal resources understood the company better than external consultants would. Secondly, by using consultants they were able to force through major change, which was initially unpopular. Once the job was largely complete then the consultants exited. Those that were left to run the program from then on were untarnished by the negativity that had been directed at the consultants.

A final benefit of this approach was that consultants had experience across multiple transformations, so had good knowledge of the potential issues. For organisations that attempt an Agile transformation themselves, there can often be a lot of painful learning in the early stages. This can delay projects and potentially even derail the adoption of Agile. While learning and optimisation is always part of an Agile environment, avoiding a lot of mistakes early on can be very helpful in both pushing on quickly and avoiding unnecessary conflict.

A pragmatic approach is vital for addressing core challenges: one size process does not fit all

The combination of disciplines makes adoption of a single, one size fits all approach close to impossible. Software is fundamentally different from hardware, so trying to build both in an identical way rarely works. For this reason Scrum is applied in a pure software team. Kanban (a just-in-time-delivery planning and process improvement system that focuses on providing a work in progress display, allowing teams to collaborate to incrementally progress the flow of

work to a next stage as and when it is required) may be used in a cross discipline team that includes hardware.

Another consideration is the nature of the project itself. For example, some projects are difficult to plan and require a more just-in-time approach to delivery. Another example is where a lot of hardware testing is needed, which requires a lot of firmware to be available. In these cases, the teams adopt Kanban, because they have found that it suits these scenarios better.

There are further examples of pragmatism at work, such as the acceptance that different types of project and the different stages of a project require different teams. A pure software team may consist of 6 or 7 people, whereas a cross discipline team may have 10 or 11. As projects move from initial development, through deployment and into maintenance, both the number of teams and team sizes may be shrunk. During the development process the needs of the project may change and so cross discipline teams may give way to single discipline teams.

Pragmatism around the implementation of Agile has extended to other methodologies. For example, some disciplines still implement the V-model with a continuous engineering process. Waterfall is no longer used, but the V-model is and its implementation has been adapted to fit in with Agile.

Not being dogmatic in the application of Agile means that the organisation can apply the approach which best fits the task in hand and the people carrying it out. This is frequently a problem for companies when they initially adopt Agile and can lead to friction between functions and even within teams. It is worth remembering that the Agile manifesto is essentially four short sentences. It is the guiding principles that are key and not a specific, detailed doctrine. This organisation has put these principles above the specifics of any given framework and in doing so has avoided a lot of internal friction; deriving greater value as a result.

Planning is still critical to bringing disciplines together

In addition to including everyone within the Agile methodology, a further key challenge for this organisation is planning. The organisation is large, globally distributed,

multi-disciplined, running multiple projects at once, and has teams of different sizes operating different Agile frameworks. Planning across all of this complexity is therefore critical to success. In addition to including everyone within the Agile methodology, a further key challenge for this organisation is planning.

A major misconception with Agile is that it excludes planning and this idea often leads to both delivery failures and friction between functions. An example is that marketing want to know when a product will be ready, but the delivery teams cannot provide an answer, because they are only focused on the current sprint. In fact, planning is even more important in Agile, due to the numerous moving parts and short time scales. For example, if a developer goes missing for a few days it can seriously impact that sprint. In the case of Scrum teams the planning for each sprint lasts for 3 weeks.

There are a couple of innovative ways in which the organisation approaches planning. The first is that they use a lot of “visual planning”. This involves the use of physical whiteboards. These are obvious and easy to use. Despite there being tooling for this type of planning, the physical nature of the whiteboard approach has been extremely effective. Everyone uses the same method, so it is easy to move between functions or teams and see project statuses at a glance.

The second approach addresses a fundamental challenge when working across software and hardware. Hardware development often has to run at a different pace to software. Whereas software can easily operate a 3 week sprint, hardware will find this very difficult. To deal with this, the teams set milestones, which should overlap, and then meet weekly to check progress and plan taking any changes into account. The milestones act as touch points where the teams come together, but aside from those they can operate at the speed which best suits them. Hardware is notoriously challenging to fit into an Agile methodology and trying to run at the same pace as software frequently results in someone waiting for someone else or slippage.

By both applying a strong focus on planning and using a common, visual approach the organisation is able to manage complexities. The company still operates a dedicated project management capability – something Agile frameworks, such

as Scrum, do not officially recognise. Again, they have shown flexibility in their Agile adoption and Agile implementation has actually benefitted from having solid planning in place.

Agile principles embraced: Hierarchical changes and empowerment at all levels

As well as placing managers into their own Agile teams, each manager was also given the responsibility of a Scrum team. This had the benefit of making the manager part of improving the processes and dealing with any challenges, as opposed to the remoteness of managers from development teams that existed previously. In addition, decision making was delegated down to all levels, rather than senior management making all key decisions. People lower down were therefore empowered. This is especially beneficial where you have developers making development decisions, as they have the experience and are closest to the issue. Management and development teams have become well integrated. These are further examples of how the organisation, which is naturally hierarchical, has attempted to flatten itself in line with Agile principles. The hierarchies still exist, but power has been disseminated to all levels. The result is faster and better decision making and planning, which is what Agile intends. Focusing on the intent of the Agile manifesto, rather than specific implementation criteria of a given framework, has served them well.

Targeted Agile tooling support applied, but with room to expand the portfolio

The key driver for adopting Agile was to improve product quality through better testing. This meant that the focus for tooling was placed on testing. Outside of testing the company has largely ignored Agile-specific tooling. The thinking behind this early on was that new tools would add significantly to the challenges of undertaking such a major transformation program. The decision not to implement Agile tools was therefore deliberate. Since then, they have been successful without them and, in areas such as planning, the visual approach using physical whiteboards has kept the requirement at bay.

This situation may change in future, as areas have been identified where tooling may help. One key area is where teams work across multiple geographic sites. A lot of the planning and collaboration is facilitated by people being

co-located: by scaling projects across locations this will no longer be the case. Tooling would help to address this challenge, through enabling collaboration and communication when people are not physically together or are operating in different time zones.

Another driver is the desire to re-use more code within software. This would require developers to have access to that code and understand its usage and other dependencies. They may also need to communicate with the original developers if changes need to be made to serve their particular use case. Tooling could help this in a number of ways, from storing the code and documentation, to enabling collaboration. The issue is more challenging within software, as hardware tends to be naturally better at re-use. Perhaps because it is more obvious in a physical product what the elements are and which are re-usable.

Finally, the organisation has come to recognise the value of gathering metrics and reporting. Currently, they measure burndown rate, but little else. The key measurement for them is meeting project milestones. This is a useful measurement, with respect to both keeping projects on track and also the efficiency of the teams. However, it provides nothing that would help to improve the Agile processes and people. Through the use of tooling, they could capture further metrics, which could then feed into training programs and process improvements. This would improve both people skills and processes.

Addressing the needs of a safety critical business by acknowledging the right place for the right documentation support

A typical myth about Agile is that it does not produce documentation. Teams still produce documentation, especially where it is essential to the various regulatory standards that must be met.

As part of the continuing refinement of Agile processes, the teams also look for ways to replace documentation with other assets that would still demonstrate compliance. An example is using tests to demonstrate that certain code adheres to certain standards. This must be done carefully however, and there is no rush to remove documentation.

Although one team may see no need for a particular document another may require it. This is one area where the final decision still lies with the senior project manager, whose budget is paying for the project.

Governance supported risk management – an ongoing evolution

An early concern, when starting with Agile, was how governance would be impacted and applied. In an industry where regulation and standards compliance is critical this issue had to be resolved from the beginning. Through the planning process the organisation implemented checkpoints, similar to those it had under Waterfall. These can be applied in the same way as milestones, which are an important element of the planning process. These checkpoints make sure that products comply with the required standards throughout development and are not just checked at the end. More importantly all checkpoints are monitored and recorded to provide the necessary artefacts to validate and trace compliance.

A key element of governance which the organisation must still follow is risk management. In a business that produces regulated products which are safety critical, good practice in risk management is essential. Active Risk Management is applied in all projects and this risk planning is managed by the project managers.

In the early stages of Agile adoption the project managers found managing these plans in the context of Agile difficult. Now they find management of these plans is actually easier than before. In large part this is down to the fact that Agile creates more order to a project than they had previously. For example, all requirements must go onto the backlog which is visible to all stakeholders and must be managed through the planning process. This avoids a common situation that existed before, which was managers making requests directly to developers. These would then be implemented in a “quick fix” style which harmed quality. They were essentially bypassing any checks or processes just to get it done. With Agile, this is not possible; everything must go via planning. By doing this, quality is improved and risk management is made easier.

Agile driven safety and an important and continued role for model based development

The Agile backlog and management of it, can provide a high degree of safety, which avoids the familiar chaotic approach within non-Agile environments. It is a common misconception that Agile is more open to chaos than Waterfall, which invests so much project time in planning. The reality is that in Waterfall a lot happens in terms of changes and last minute requests during the development phase. These do not go through planning or any official processes. Code is more likely to become bloated and unnecessarily complex, which can lead to bugs. With Agile the only way something gets done is if it goes via the backlog, which everyone can see.

Another controversial decision, taken recently in the context of Agile, has been the move to model based development. This is still evolving within the organisation, but so far the view is that it and Agile complement each other. Model based development is frequently seen as a very Waterfall

type approach, requiring a lot of upfront planning. Again, the organisation has demonstrated flexibility within both the model based approach and Agile to make them work together and derive the value from each.

A contented workforce makes for smoother transformation

A strength of the organisation has been its high level of employee retention; even those who leave frequently return. The transformation to Agile was not initially popular amongst everyone. The fact that employees were happy being part of the company helped them to retain them throughout the change. Such transformation programs can often lead to a number of people being lost, which has a negative impact on the business as experience and knowledge is lost. Replacing people also costs money. By running an organisation that people want to stay a part of they were able to push through the Agile transformation without suffering these problems.

Agile Impact



Improved leadership and greater clarity of costs to support better pricing models

As a result of Agile management has improved. Previously they had prioritised certain projects over others, often as a result of pressure from customers. This would negatively impact other projects. This could manifest itself through delays or a reduction in quality as, for example, testing time gets squeezed. Agile requires that all projects are treated equally and so managers can no longer prioritise one over others. With the increase in communication and daily planning, management is provided with almost real time information that allows them to make decisions earlier. Combined with decision making being delegated down to all levels of the organisation, this makes management more responsible.

At the same time, Agile allows management to provide better information about project costs to the sales teams. Through Agile, it is possible to know very accurately how much time developers spend on a specific project. One of the issues under the previous system was that developers could be asked to do work outside of the project plan, resulting in developers doing more work than was officially recognised. By working only from the backlog this “unofficial” process was no longer possible, making recording the amount of time spent on a project more accurate. This meant that the difference between cost and price could be managed much better.

Communication is key to improving customer satisfaction

Customer satisfaction has always been key for this organisation and Agile has brought improvements in this area. There is now a far greater focus on the customer as they have become far more involved in the development process. Rather than having to wait until the end when a product was complete to express any feedback, they can now provide feedback throughout the process. There is far more communication between the teams and the customer, and even developers are empowered to speak with them.

This increased interaction, especially at the developer level, means that potential problems are spotted earlier and developers have a deeper understanding of requirements and the reasoning behind them. The overall result is better products and happier customers.

Communication has not just improved between the organisation and its customers, but also internally, both within and between teams. This starts with the daily stand-ups where people learn who is doing what, how long it will take and where there are dependencies that could cause delays. Everyone knows the status of the project every day. A particular issue that this addressed was any of the developers misunderstanding requirements. Previously if this happened it would not be discovered for some time, often very late in a project. The increased communication has removed this problem. A further by-product of increased communication was knowledge transfer, as team members learn from one another constantly.

Insight gained



This company's story highlights how moving to Agile benefits greatly from being driven by senior management. In this case, they even placed themselves into the Agile process to experience what it's like to work within an Agile environment. This also meant that all functions had to adapt to the way Agile works. By doing this, they avoided the friction that can occur when different functions operate processes suited to different methodologies. With everyone pushing in the same direction the whole product creation and support process runs smoothly.

Taking a pragmatic approach to Agile and the different frameworks, such as Scrum and Kanban, has allowed the company to adopt ways of working that best suits them. They put the essence of the Agile manifesto ahead of the specifics of any single framework. One good example of this is that they made changes to the way in which decision making was delegated down to all levels. This empowers people who are in the best position to make decisions to actually make those decisions. This follows the Agile manifesto principle of not having a hierarchy, but within an organisation that inherently has hierarchy.

The fundamental importance of planning comes through very clearly. Planning is often a controversial subject within Agile, with some people believing that it is against the principles. This company has proven how a strong planning framework with project managers can actually enable Agile. They have delegated planning down to all levels of the company and put in place a visual planning system that is common to everyone, so the status of any project is available to everyone in almost real time. It also

means that governance can be applied and so essential standards applied and enforced. Furthermore, different teams operating in different disciplines (such as software and hardware) and even different Agile frameworks (such as Scrum and Kanban) can synchronise their work.

Communication both internally and externally has been greatly improved. As a result the customer is much more closely involved in projects. Requirements are better understood, potential problems identified earlier and the customer gets what they want and is happier as a result. The daily stand-up is seen as key to improved communication within teams and enables projects to run more efficiently and to time.

Finally, the basic principle of testing early and often has increased quality of the final product, which was the original ambition when moving to Agile. Projects are not necessarily delivered faster, but that was not one of the aims. Instead, projects are delivered within the same timeframe, but quality is much better, which is what matters most to customers.

Going forward



Despite achieving success and maturity in their Agile adoption, they recognise that there is more work to do. The future means looking at better metrics, probably through the adoption of more tools. The goal of better metrics is to improve skills in the right areas and optimise processes both of which will continue to raise the quality of products. The result of Agile so far has been to improve the business as a whole.