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I V E C O • G R O U P

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Implementation of Project Management Methodologies on CONFIGIT Project

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ABSTRACT

In this analysis, the project management techniques such as SWOT analysis, Kanban and Scrum are described. Subsequently, the application and use of these techniques in a real-life project, Configit, is depicted. Configit is a mid-size project for the truck-maker company Iveco in which the old configurator for vehicles is replaced by a new one.

The objective of this analysis is to understand if the project management techniques are effectively applied. Some screenshots related to the configurator and the systems used to implement the project management techniques are provided so that the definitions are clearer. This analysis shows that some companies are trying to benefit from the new technologies and methods. But “how effectively they apply them” will be understood better towards the interview and conclusion section. Interview section includes an interview with the Project Manager of the Configit project, Alberto Russo.

This document is written from the eye of the “Product Databanks” department of Iveco, thus, the information provided is limited. Confidential data related to Iveco which are sensible or risky may be modified or eliminated in order to respect to the company policy. The privacy policy is respected in order to not reveal any disclosed information about any internal or external Iveco dependent.

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1 Presentation of Iveco

Iveco SPA is a prominent actor in the worldwide transportation industry, developing, manufacturing, marketing, and servicing a wide range of light, medium, and heavy commercial vehicles. It was incorporated on 1 January 1975, with the merger of five different brands: FIAT Veicoli Industriali (with headquarters in Turin), OM (Brescia, Italy), Lancia Veicoli Speciali (Italy), Unic (France), and Magirus-Deutz (Germany) and now is wholly owned subsidiary of CNH Industrial which by the 4th quarter of 2021 will be separated completely with a spin-off and Iveco will continue its path with the name, IVECO GROUP.

It also produces passenger transport vehicles as well as customized vehicles for defense, civil protection, and specialized roles such as firefighting. The vehicles use the most advanced engineering technologies, which are applied to a wide range of diesel and alternative fuel engines. Natural gas (CNG), biofuels, hybrid technology, and electric engines are among them.

The product range is complemented by a range of financial and after-sales services and used vehicle activities. Iveco has a presence on all five continents, with over 25,000 employees: 27 manufacturing units in 16 countries across the world produce automobiles using cutting-edge technology developed in six research centers. The corporation has operations in China, Russia, Australia, and Latin America in addition to Europe. Their technical assistance is available in all geographic areas where an Iveco vehicle is in use, thanks to an extensive after-sales network of more than 5000 service shops in more than 160 countries.



IVECO vehicles are used all over the world. The brand designs, manufactures and sells a huge range of light, medium and heavy commercial vehicles for on and off-road use. The key players in the brand's product line-up are the Daily, a vehicle that covers the 3.3 – 7.2 ton gross vehicle weight segment, the Eurocargo from 6 – 19 tons and, in the heavy segment above 16 tons, the Trakker (dedicated to off-road missions) and the IVECO WAY range with the on-road IVECO S-WAY and the IVECO X-WAY for light off-road missions. The brand is the only producer offering ecological diesel and natural gas engines on all of its range and was the first commercial vehicle manufacturer to make a substantial investment in natural gas, developing engines optimized to use CNG (compressed natural gas) and LNG (liquefied natural gas).

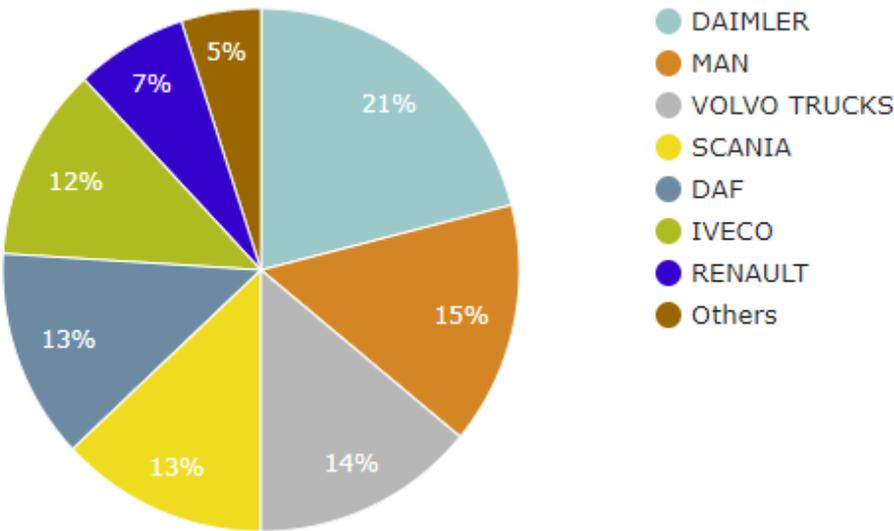


Figure 1: Market Share Distribution in Truck Segment

As it is seen on the pie chart above, Iveco is positioned as 6th out of 7 big brands and others. Daimler is the market leader who produces Mercedes Trucks. However, the following six brands are so close to each other that the rivalry among them is fiery.

The worldwide output of the company amounts to around 150,000 commercial vehicles with a turnover of about 10 billion €.

As July 2021, financial results presented under U.S. GAAP are announced as following:

Net sales of Industrial Activities of \$8,490 million, up 65%, with solid performance from all segments, as a result of higher volumes driven by strong industry demand and price realization.

Adjusted EBIT of Industrial Activities of \$699 million (loss of \$58 million in Q2 2020), with all segments up year over year. Agriculture adjusted EBIT margin at 14.7%. Adjusted EBIT of \$100 million for Commercial and Specialty Vehicles, \$74 million for Powertrain and \$24 million for Construction.

Adjusted net income of \$583 million, with adjusted diluted earnings per share of \$0.42 (adjusted net loss of \$85 million in Q2 2020, with adjusted diluted loss per share of \$0.07).

Reported income tax expense of \$188 million, with adjusted effective tax rate (adjusted ETR) of 25%.

Free cash flow of Industrial Activities was positive \$1.0 billion due to the strong operating performance. Total Debt of \$24.5 billion at June 30, 2021 (\$26.1 billion at December 31, 2020). Industrial Activities net cash position at \$1.4 billion, an increase of \$0.8 billion from March 31, 2021.

Available liquidity at \$14.4 billion as of June 30, 2021. In May 2021, CNH Industrial paid €150 million (~\$180 million) in dividends to shareholders. In the same month, CNH Industrial Capital LLC issued \$600 million in aggregate principal amount of 1.450% notes due 2026.

1.1 Spin-Off CNH-Iveco

“CNH Industrial, the agricultural equipment maker controlled by Italy’s Agnelli family, will spin out truck maker Iveco as a separate business as part of a five-year plan to double profits.

The company will hive off Iveco, Iveco Bus and the Heuliez Bus commercial vehicle brands, along with its powertrain business, into a separate company with revenues of \$13bn by 2021.

The remaining company will comprise the tractor business and construction equipment divisions, as well as special vehicles such as firefighting trucks, with combined revenues of around \$16 bn.

“The bold plan will lead to the creation of two new global leaders in their respective fields,” said CNH chair Suzanne Heywood.

The move continues a trend begun by Fiat Chrysler’s late former chief executive Sergio Marchionne, who separated both CNH and Ferrari from the carmaker, creating huge amounts of value in the process.

The split is part of a five-year plan unveiled on Tuesday by CNH to increase its profit margin to 10 per cent by 2024, more than double current levels.

It plans to invest \$13 bn into product development over the period, with the expectation that profit-per-share will rise from \$0.86 at current levels, to \$2 by 2024.

Truck businesses tend to attract higher trading multiples than carmakers, but lower valuations than tractor-making groups.

The planned split echoes Volkswagen’s decision to list part of its own truck brands, MAN and Scania, which began trading as Traton Group in June, though the listing was delayed and raised only €1.6 bn, much lower than had previously been planned.”

(article of Financial Times Peter Campbell in London SEPTEMBER 3, 2019)

1.2 From Engineering to The Customers

Piano gamma is the point where all starts in the sense of a product marketing implementation. After the engineering design and feasibility tests, it is the point where marketing and engineering are separated. At this stage, the framework called PRP is used to manage the codes depicted in 2 Useful Terms. These codes are used all over the company not just for commercialization and production but even for sales and after sales. In PRP, the catalogues are formed to define the technical characteristics of the vehicle and market requisites in the commercial catalogues what we call Unit of Work (UOW). UOW is the main catalogue that contains the market region, rules between OPTs defined by the engineering, commercial client packages, rules between packages, models list, etc. Each market has one or more UOW and these will be published and transmitted to SAP. Once the catalogues are activated by the market headquarter, the catalogues will be a guideline for the configurator, Configit. It is seen that the Piano Gamma is where we introduce a new model such as Daily, Eurocargo, S-WAY, etc. This stage PRP is defined by assigning a specific code for each optional and characteristic. When a new gamma is launched, FDP, FCP, FCG, OPT, VCB codes are defined on the framework called NPSS. Clients will order the vehicles providing each time a code created by the dedicated software which is defined in detail later in this document. Successively, the rules among these characteristics must be defined so that there is no contradiction between the orders and the plant. For instance, some features may not be added together with other features for technical or legislative reasons. Every time a new product line is launched, the coherence with the older gamma is tried to maintain in order to avoid confusion and complexity. In order to understand what is after piano gamma, it is better to investigate the following chart. This chart is called the PRP support organizational chart.

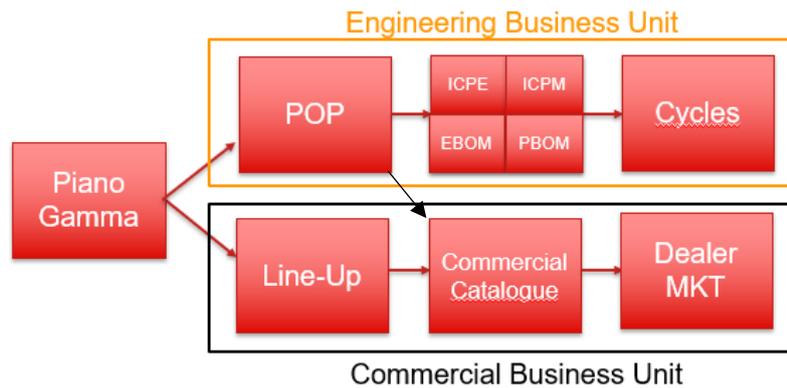


Figure 2: PRP support organizational chart

Proceeding from piano gamma to the engineering business unit, new LDP (Linea di Prodotto – *Product Line*) is created during a business unit which is called Piano Operativo Prodotto – *Operative Product Line* (POP). POP allows us to introduce all the technical characteristics and OPTs inside a model. By having this set of information ICPE, ICPM, EBOM and PBOM are defined which are the various abbreviations for lists which shows all the components and the parts of a vehicle.

Note that there is a bridge between POP and the Commercial Catalogue which enables the mono directional information flow from one to another. Indeed, without the green light from POP, it is not possible to proceed to create the commercial catalogue. Commercial Catalogue known also as UOW is created following the information provided from POP and transform into a document. Each market has different approach and needs from the vehicles due to legislative, cultural or geographical aspects so, for each of them another special type of a catalogue must be made. This process requires the information flow from colleagues working in marketing departments of various regions/countries towards Piano Gamma.

From the dealer market, customers will be available to order the specified vehicles according to their needs and any error is avoided by the support of PRP.

After all these passages, the dealers use Configit to introduce orders in which they can choose the commercial vehicle packages such as Business Pack, Business Exclusive Pack, Winter Pack. etc. The dealer sees only the OPTs which are allowed to be seen but in Iveco headquarter, the Product Databanks department may add other OPTs which are actually excluded (not visible) to market. These exclusive OPTs could be ordered due to a special demand or cost reduction. This exclusive operation is called a "Spot Offer".

Every time the dealers enter an order, a new VP code is generated by SAP which consists of 14 characters. First 8 characters are called VCB and they define the type of the vehicle, driving side, gearbox type and suspensions. 9th and 10th characters are defined as VM code which indicate the obligatory optionals required by the market. VM code is no more utilized with the introduction of the "logica aperta" (explained in following) since the system shows the dealers only the optionals which are allowed to add on the vehicle for a specific region, so they are defined as "00". The last remaining 4 characters instead are for the optionals. Iveco has this system running for many years and within the years it changed a lot since it was first launched. First there was a logic called "logica chiusa", which by Italians which means "closed logic". Logica chiusa did not use to allow dealers to create a vehicle from zero but to choose among existing VP codes. Now the logic is changed to "logica aperta" which means "open logic". With this new system it is possible to create a new VP every time a characteristic of a vehicle is changed or an OPT is added/removed. Evidently, this new system permits to have a more flexible system running both for the dealer and the central workers.

Furthermore, talking about Daily model for instance, IVECO produces the vehicles with the chassis and the cabin excluding the Van models. Therefore, these models are not ready for the use by the clients for various work. Bodybuilding of the vehicle must be done by the specialized entity and these entities take the special requests coming from the clients to transform the vehicles ready for the specific work. For example, C30C is a version of Daily and it comes out from the establishment without any dressing behind leaving a naked chassis. For instance, if the customer would like to use the vehicle for transporting meat, refrigerator should be mounted in the back. Iveco would provide vehicle ready to use with the refrigerator mounted near the plant and this process is called CCM RNP. Instead, if it is mounted at the location of the market, it is called CCM near market. There are over 600 systems and softwares running behind all these operations under Iveco brand. For the commercialization part SAP and PRP are the most exclusive ones. Without the help of these softwares, it would have been very difficult to manage this complex network of information flow.

2 Useful Terms

Before continuing to the rest of the document, it is advised to go through the following bullet points since the language used contains special terms.

- *SAP: (System Analysis Program Development) The software used for Order Planning, Logistics, Sales, Sales Support and Marketing activities*
- *PRP: (Product Representation Process) The local framework of Iveco used to define product characteristics and client CCG*
- *NPSS: (New Product Sub System) The framework used to define all the characteristics of a product from model codes to OPTs contained in a vehicle*
- *VM Form: The excel file that contains the **OPTs** (optional) which should be rendered available on the commercial catalogue*
- *FGC: Senior category for the CCGs for a certain function. Every vehicle should have one CCG selected for each FGC*
- *CCG: Client Optional (in vehicle configurations) a.k.a. **OPT** (optional). Subcategory of FGC*
- *CCM: Special Customization Requests (i.e., longer wheelbase, additional seats)*
- *FDP: For each model range (gamma), FDP code contains the most principal characteristics such as wheelbase or structure of the vehicle (i.e. rigid/articulated) or engine type. For example, BG4R is an FDP code for S-WAY Natural Power AD/AT Engine Type C9 4x2*
- *VCB: This code is an extended version of FDP and contains characteristic information such as cabin type, gearbox type, suspension configuration, wheelbase, total ground mass, etc. (ex: BD7CD8D2)*
- *VM: This is the VCB code plus two numbers (ex: 01) which helps Iveco to distinguish between differently managed markets*

- *VP: Even more extended type of VM code which adds six more numbers. With this code it is possible to visualize every characteristic including the OPTs of a configured vehicle.*
- *IPC: Old version of the configurator*
- *Normal Offer: The normal mode of the configurator, visible only for the dealers*
- *Spot Offer: The other mode of the configurator. It is a way of modifying the orders allowed only by the Product Databank team. This mode lets to trespass all the market rules. It is a process to be carefully verified in order to avoid any technical contradictions.*

3 Configit

Even if insiders of Iveco call the configurator “Configit”, it is the name of the company providing configurator solutions. Their solutions are based on Virtual Tabulation®, a multi-patented configuration technology that easily integrates into applications to solve configuration challenges across business functions. Through partnerships (such as Jaguar, Land Rover, ABB, Kohler, CNH Industrial) with industry-leading systems integrators, Configit creates a community of platform apps and services. In this document, by Configit, it is meant the configurator project instead of the company.

An analysis of the project management techniques for the project Configit is held in this document. Configit is essentially a new version of a configurator only for the dealers and central workers to upload and modify the orders. Product & Vehicle Configurator is an application designed to support sales, facilitating product design by the customer. The whole process uses data available in the SAP system and in the future will allow for a 3D visualization of the product in design. It works accurately creating a correct configuration based on characteristics described in the SAP system, has an ability to create an order by the customer themselves, ability to check the price and the product availability date and is flexible with the option to enrich the solution with additional features.

Configit is the substitute for the previous configurator called Internet Pricing Configurator (IPC) which was introduced in 2002. IPC can be considered as the base of Configit but is totally different as a platform. Both configurators are visualized in SAP but Configit calls a website from Microsoft Edge or Internet Explorer while the IPC is integrated within SAP.

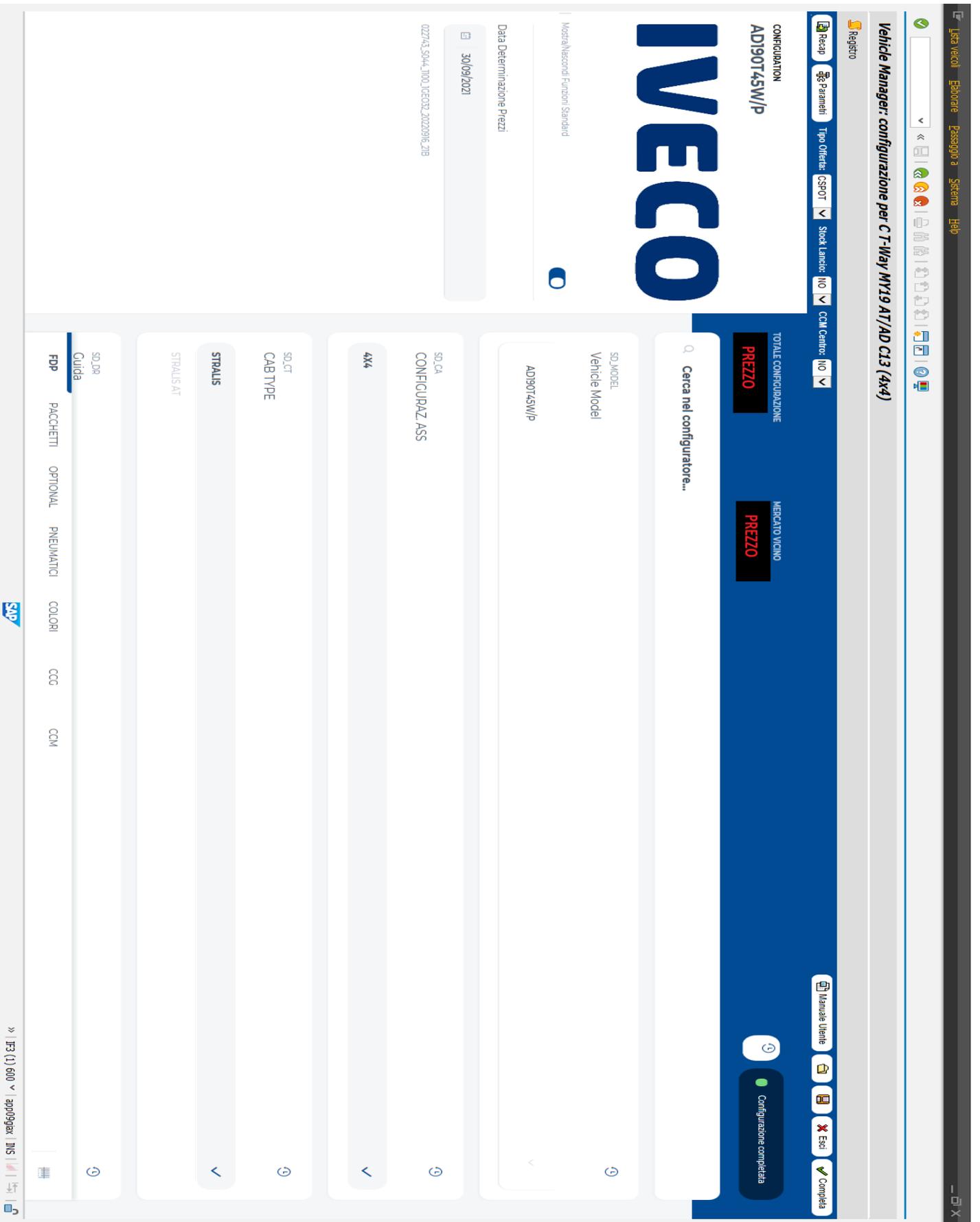


Figure 3: A Screenshot of Configit

3.1 How does Configit work?

Configit takes the base data related to the vehicle from SAP and every time a configuration is created. It generates an ID transmitting all the selected characteristics which later will be transformed to a product visible on Configit User Interface ("UI": graphic interface of the software within SAP). In this document, the technical part of programming characteristics will not be dealt with since it is not relevant.

3.2 SAP

SAP (System Analysis Program Development) is a global software firm headquartered in Walldorf, Baden-Württemberg, that produces enterprise software to manage corporate operations and customer relationships. The firm is particularly well-known for its ERP software. SAP is the world's third biggest publicly listed software firm by revenue, the largest German corporation by market capitalization, and the largest non-American software company by revenue. The company's integrated apps link all aspects of a business into an intelligent suite on a completely digital platform, thereby replacing the process-driven traditional platform. SAP now has over 230 million cloud users, over 100 solutions spanning all business areas, and the most comprehensive cloud offering of any supplier.

3.3 What is SAP used for?

Data management is frequently decentralized in traditional company models, with each business function maintaining its own operational data in its own database. Employees from various company departments are unable to access each other's information as a result of this. Additionally, data duplication across many departments raises IT storage costs and increases the chance of data inaccuracies.

SAP software combines numerous business operations with a single view of the data by centralizing data management. This enables firms to better

manage complicated business processes by providing real-time information throughout the enterprise to employees from various departments. As a consequence, organizations can speed up workflows, increase operational efficiency, boost productivity, improve customer experiences, and boost revenues. From raw material procurement through manufacturing and customer satisfaction, the program collects and processes data on a single platform. SAP systems can be placed "on premise" on a local network or accessed through the cloud, allowing businesses to evaluate and develop the complete value chain more effectively. SAP solutions may also be used to anticipate things like when a machine needs to be fixed or how income will grow over the following future.

3.4 SAP for Iveco

SAP gives support to Iveco since 2002 and it plays a crucial role to the company. Every transaction related to Order Planning, Logistics, Sales, Sales Support and various Marketing activities are managed on this software. SAP works very well and integrated with the local frameworks. PRP system is one of these frameworks where all the technical regularities, prices, dates, etc. are defined and transmitted. SAP takes this set of information and aligns them with configurators, price lists and to many more programs that are fundamental for the company.

SAP has been developed and improved by the aid of the IT Service department dedicated for itself. Every malfunction or bug is fixed right away only in days with full support just by opening a ticket. Right now, it is possible to say that most of the operations in Iveco is dependent on SAP which gives a very big competitive advantage to both SAP and Iveco.

3.6 Situation Before Configit Project

IPC Configurator was long-standing and was not able to deliver the best for Iveco workers and customers thus making it obsolete. It was based on the 2000's logic which is now making operations seem complicated. For instance, if an OPT is added on a vehicle but the rules between another OPT does not allow the change, both OPTs should be reset in order to continue with the modification. Now, this issue is solved with Configit and roughly speaking, this removes about 3 minutes from the non-value-added time which is considered a significant amount of time on the daily basis. In addition, it was not possible to see the OPTs which are disabled by other OPTs with the rules but with Configit, they are seen in grayed out format. These small but effective changes are very important to consider because it reduces the time waste, thus, increases the operation efficiency.

Aesthetically speaking, IPC seems like an ancient software and it was obvious that it needed a visual update not just to make it beautiful but also to make it a more presentable, prestigious platform. In the following figures, a comparison between the old configurator IPC and the new one, Configit.

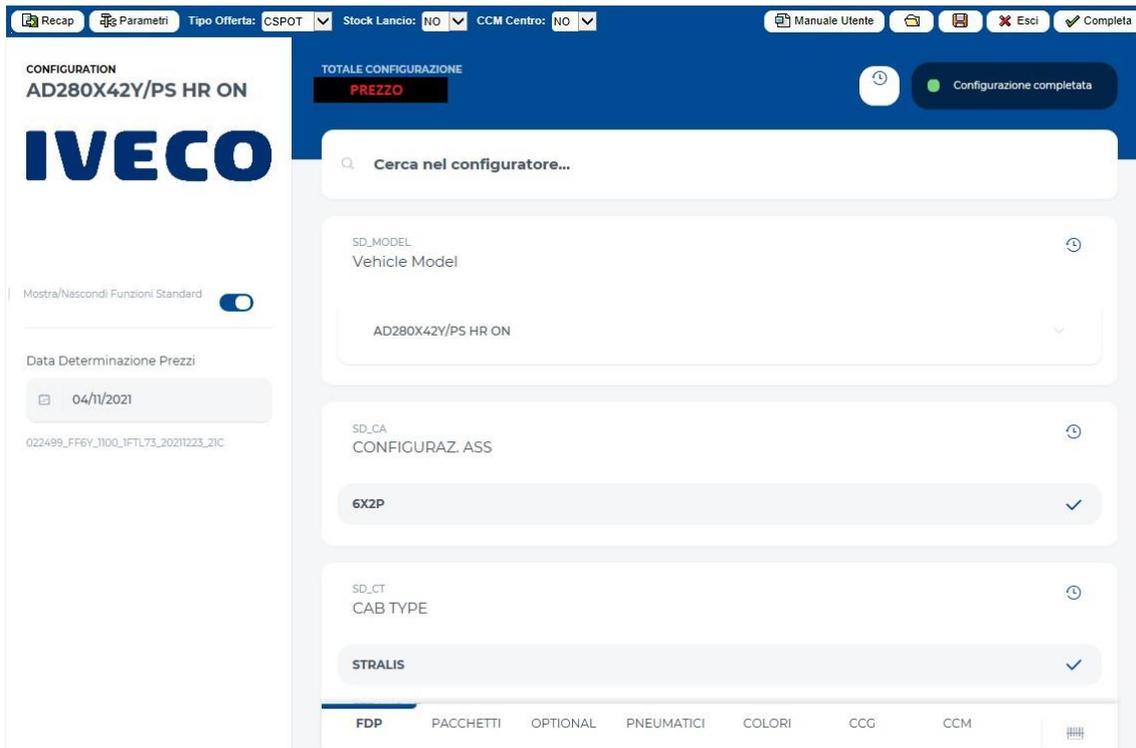


Figure 4: Configit, configuration for a C X-Way MY19 AT/AD C9/C11 6x2P

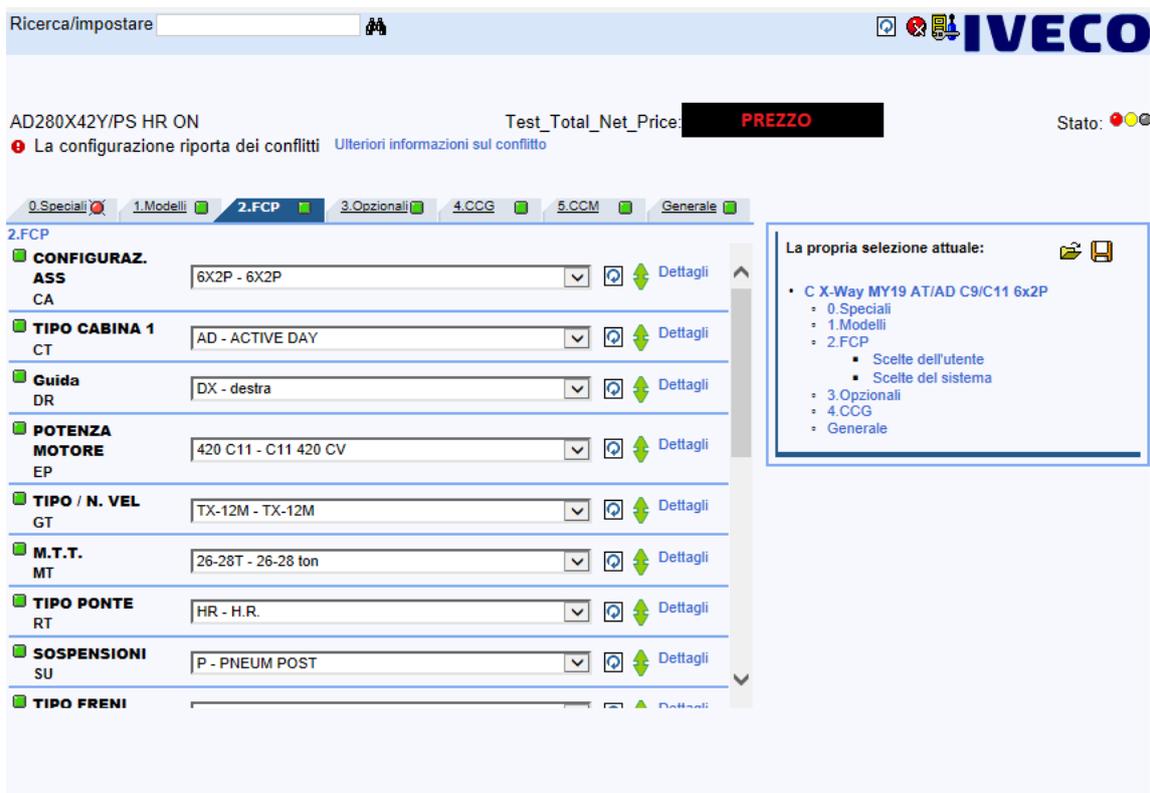


Figure 5: IPC, configuration for a C X-Way MY19 AT/AD C9/C11 6x2P

4 Tools

- SWOT analysis
- Kanban
- Scrum

4.1 SWOT Analysis

Firstly, a SWOT analysis is a technique and it's used for strategic planning and analysis. SWOT Analysis is short for strengths, weaknesses, opportunities, and threats and it's a business strategy method used to determine how well a company compares to its competitors. Albert Humphrey is claimed to develop this strategy in the 1960s, however this claim is questionable. There is no recognized inventor of the technique. It's also known as the SWOT Matrix, and it's shown to be effective in distinguishing and building a niche within a larger market. Outside the corporate sector, SWOT Analysis may be used to examine a person's status in relation to their competitors on a more personal level. The technique takes into account both internal and external factors.

Strengths and weaknesses are internal and represents the things you have some influence over and can change. Who is on your staff, your patents and intellectual property, and your location are some examples for this concept. Opportunities and threats are external and represents the things that occur outside of your firm. You can capture chances and defend against threats, but you can't change the situation. Competitors, raw material pricing, and client shopping tendencies are some examples for this concept.

SWOT Analysis is not actually considered as an Agile methodology but companies work this type of analysis for almost every project which makes it a fundamental step and worth spending words on.

When SWOT analysis is implemented, it is possible to have a good approach for prioritizing the tasks needed to perform to build a solid business. The business owners and executives of a firm must be intimately involved in a SWOT analysis for it to be effective. But to get the best outcomes, it is important to bring together a group of people with a variety of opinions on the firm.

It may be used to discover new solutions to issues, reveal obstacles that may restrict aims and objectives, and assist in deciding on the most successful course of action. It also serves as a brainstorming tool, revealing potential and constraints for change, revising strategies to better manage systems, communication and organizations.

SWOT is defined by 2 x 2 matrix which consists of Strengths, Weaknesses, Opportunities and Threats. So, the column on the left has the helpful elements to the business which has Strength and Opportunities below it. Instead, the second column on the right has the harmful items which are the Weaknesses and Threats. Moving to the rows, on the top, the internal effects are present while on the second row there are the external effects. In the figure, an example of a SWOT matrix is shown.

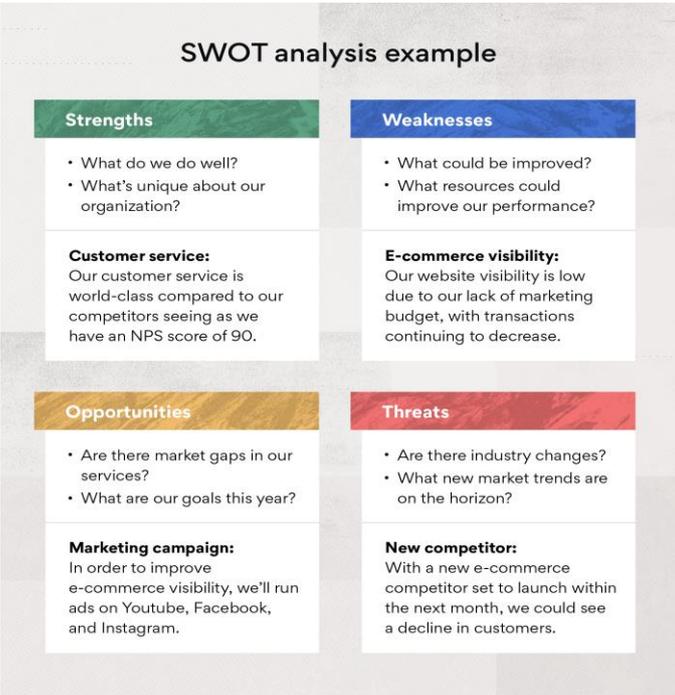


Figure 6: An example of SWOT Analysis "<https://asana.com/it/resources/swot-analysis>"

When a SWOT matrix is created, the following questions should be asked in order to be completed properly. These questions are concentrated more on general businesses, companies and start-ups but in this document, they will later be inverted in a way that they can be implemented on projects, specifically for Configit.

Strengths:

- Which business practices have shown to be effective?
- What are the strengths of your teams? (i.e. knowledge, education, network, skills, and reputation)
- What tangible assets, such as clients, equipment, technology, cash, and patents, do you have?
- What are your competitive advantages over your competitors?

Weaknesses:

- Is there anything your company needs to be competitive?
- What business procedures do you think should be improved?
- Do you require any actual assets, such as money or equipment, for your business?
- Do you have any vacancies on your team?
- Is your current location favorable to your success?

Opportunities:

- Is your market growing and are there trends that will encourage people to buy more of what you are selling?
- Are there upcoming events that your company may be able to take advantage of to grow the business?
- Are there upcoming changes to regulations that might impact your company positively?

- If your business is up and running, do customers think highly of you?

Threats:

- Do you have potential competitors who may enter your market?
- Will suppliers always be able to supply the raw materials you need at the prices you need?
- Could future developments in technology change how you do business?
- Is consumer behavior changing in a way that could negatively impact your business?
- Are there market trends that could become a threat?

SWOT Analysis for Configit

Iveco uses the SWOT analysis frequently before launching a project during the feasibility tests. This method is commonly used by project managers who seek to discover the potentials and impotencies or pros and cons of a project. Appliace of SWOT in projects related to research and development field is perceived more often with respect to the other areas since they should foresee the market reaction and attitudes. In this section, the questions which indicated in the sub-chapter before are inverted in such a way that they can be applied to the Configit project.

Strengths:

- Which IPC configurator practices have shown to be effective?
 - ✓ Fast, reliable, easy to intervene and fix bugs
- What are the strengths of the support team (SAP, IT, Configit teams)? (i.e., knowledge, education, network, skills, and reputation)
 - ✓ All the teams (Product Databank, Order Management, Product Management, Dealers) knows how to operate the configurator, IT support teams know how to intervene, SAP has full support since the software is highly customized for Iveco
- What tangible assets, such as clients, equipment and technology do you have?
 - ✓ The technology is a solid and rooted which gives advanced reliance
- What are your competitive advantages over your competitors?
 - ✓ Having a customized a software

Weaknesses:

- Is there anything your company needs to be competitive?
 - ✓ Iveco should aim for a younger atmosphere, referring to both the people and the software because these elements are a bit obsolete.
- What business procedures do you think should be improved?
 - ✓ At the software level, things run still pretty manually in Iveco, meaning that more workforce is needed to complete the tasks.
- Do you require any actual assets, such as money or equipment, for your development of the project?
 - ✓ Money is a fundamental issue and when a software is developed, IT companies charge a lot, specifically when it is highly customized.
- Do you have any vacancies on your team?

- ✓ No, IT services are outsourced so is not managed internally which puts Iveco in a sort of customer position.
- Is your current location favorable to your success?
 - ✓ Yes, software development can be successful regardless of the location.

Opportunities:

- Do the users want more and are there any trends that will encourage *Iveco* to develop its service?
 - ✓ IPC is getting obsolete and all the competitors are switching to the newer, more customized, more useful and aesthetically more beautiful softwares.
- Are there upcoming changes to company that might impact your company positively?
 - ✓ The fact that Iveco getting younger with new employees, makes thing difficult to learn the IPC configurator. This can be seen as an opportunity or a signal which indicates it is time to switch.

Threats:

- Will SAP always be able to supply technical support you need at the prices you need?
 - ✓ Iveco is dependent to SAP since their system contains all the database in their servers and the softwares are customized based on company's needs. It is not a favorable situation but outsourcing the IT services definitely brings cost reduction at some level.
- Could future developments in technology change how you do business?
 - ✓ Yes, most probably, but with a very slow rate. Configit will amortize its value by being used for many years.

- Is user behavior changing in a way that could negatively impact your business?
 - ✓ Users of the configurator wants a better structured, easy-to-use software. Configit's problem may be the slowness of in the first period when it is still being developed and used simultaneously.

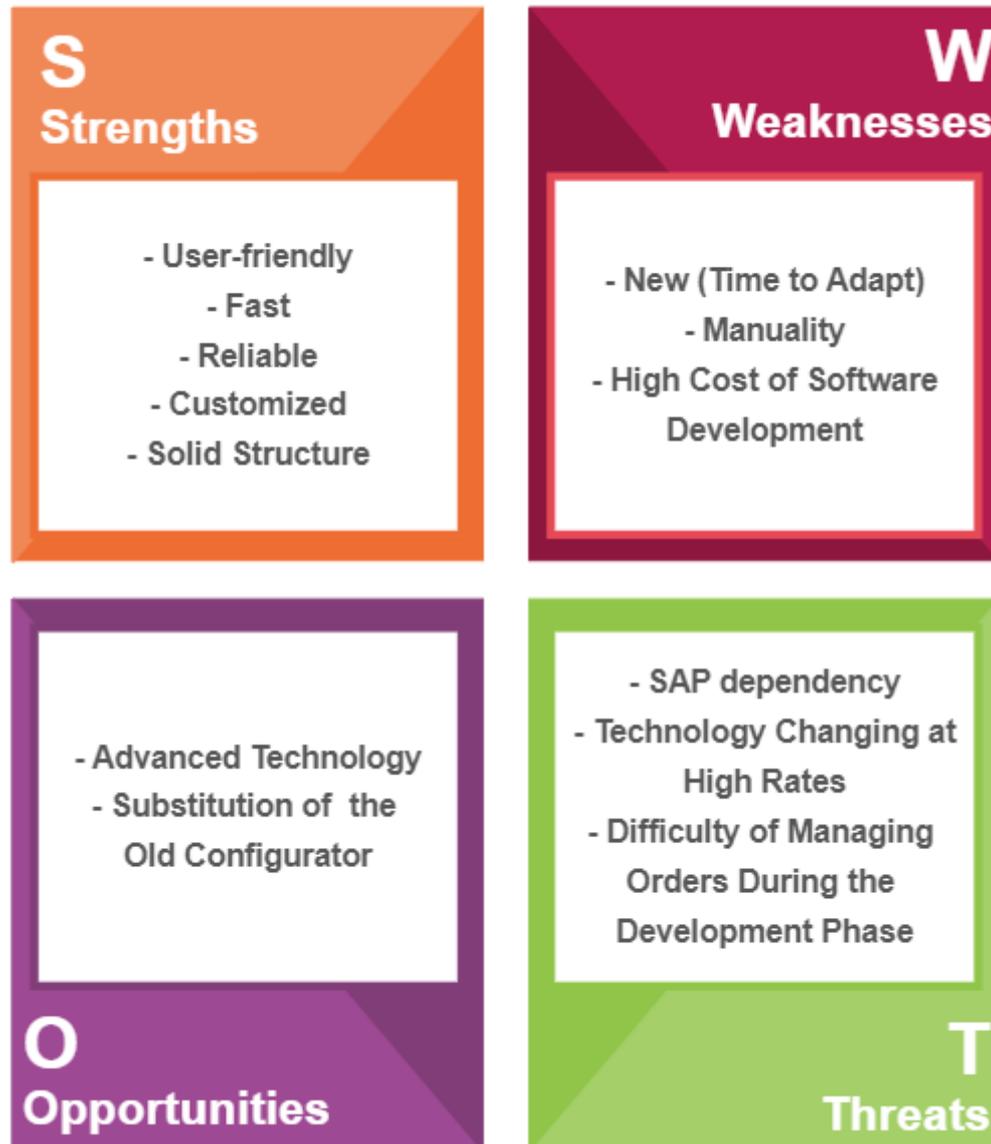


Figure 7: SWOT Analysis of Configit

4.2 Kanban Methodology

This topic is particularly important because it is widely used across Iveco during the development stage of new projects. Specifically, for Configit, this method is applied directly and will be shown later with screenshots. A wide analysis of the definition of this method will be made in order to examine all the important points about Kanban method applied in real life.

Kanban is a workflow management technique for identifying, controlling, and optimizing knowledge work services. Its goal is to assist you in visualizing your task, maximizing productivity, and continually improving. It emerged in manufacturing and had since been claimed by Agile software development teams. It has just recently begun to be acknowledged by company units from numerous sectors.

The Japanese word "Kanban", implying "visual board" or a "sign", is used in the sense of a process definition since the 1950s. Toyota was the first company to create and use it as a scheduling system for just-in-time manufacturing. The capitalized name "Kanban," on the other hand, is well-known and related with the development of the "Kanban Method," which was originally established in 2007. It started out as a scheduling system for lean production, based on the Toyota Production System. Toyota began using "just in time" manufacturing in its production in the late 1940s. Just in time is a strategy based on having the parts needed for production at the right place at the right time, reducing the stock costs. The strategy is based on a pull system. This means that production is driven by consumer demand rather than the traditional push model of producing items and pushing them to market. Their one-of-a-kind production system laid the foundation for Lean manufacturing, or simply Lean, aka Agile. Its primary goal is to reduce waste without losing productivity. The major objective is to provide greater value to customers while reducing expenses.

Kanban Methodology

Key businesses in the software sector instantly understood how Kanban might improve the way goods and services were delivered around the beginning of the century.

Kanban departed the automobile industry's domain and was effectively adapted to other complex business areas such as IT, software development, R&D, and others, with an enhanced focus on efficiency and by utilizing developments in computer technology. Like in this case, for Configit.

In fact, the Kanban Method, as we now know it, first appeared in early 2007. Years of testing, expertise, and collaboration by major individuals in the Lean and Agile communities.

The most basic Kanban board would be a one with three essential columns: "Requested," "In Progress," and "Done". It acts as a real-time information repository when built, managed, and functioning properly, revealing system bottlenecks and anything else that could disrupt smooth working practices.

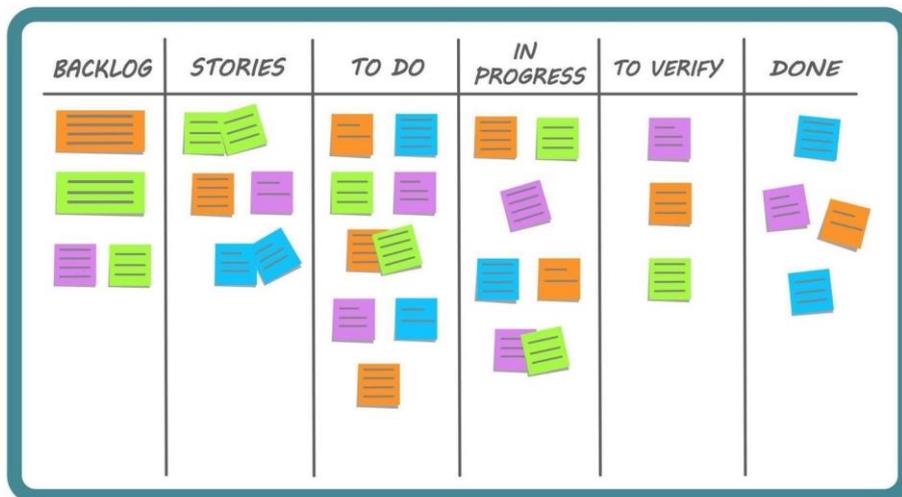


Figure 8: Example of a Kanban board "it.vecteezy.com"

There are some simple and basic *change management* principles to follow when the Kanban methodology is applied, which are the following:

1. To begin with what is being done now. Kanban allows you to layer the approach on top of current workflows, systems, and procedures without affecting the current system. Existing processes, jobs, responsibilities, and titles are valued and should be preserved, according to the technique. Consequently, it will bring to light issues that need to be addressed, as well as assist in assessing and planning changes to ensure that they are implemented smoothly.
2. To make small but evolutionary changes. By including collaboration and feedback, it enables small incremental and evolutionary improvements to the present process. In general, large-scale changes are avoided since they are often met with opposition because of fear or uncertainty.
3. To promote the acts of leadership. Kanban makes the leadership look and feel like it is for all levels. Each person having their tasks visualized commonly makes the working atmosphere more shared. This way, observation of each person encourages a continual improvement attitude which makes possible to achieve an optimum performance across the company.

On the other hand, there are also some service aimed principles, which are the following:

1. Concentrate on the needs and expectations of your customers. An organization's focus must be on providing value to its customers. Knowing your clients' requirements and expectations draws attention to the quality of the services you give and the value you deliver.
2. Organize the work. When you manage the work in your network of services, you enable individuals to self-organize around the job. This allows you to concentrate on the intended outcomes rather than the "noise" caused by micromanaging the service providers.

3. Examine the Service Network on a regular basis. To promote a customer service culture, a service-oriented strategy must be evaluated on a regular basis. Kanban promotes the improvement of supplied outcomes by conducting frequent assessments of the network of services and evaluating the work policies in use.

Kanban Appliance

The appliance of Kanban Method has some few steps and each organization should make sure to follow them.

Step 1: Create columns according to your workflow

A Kanban system requires a board with cards and columns to view the workflow. A stage in your workflow is represented by each column on the board. A work item is represented by each Kanban card. The Kanban board depicts the current status of the processes, including all risks and specifications. It is fundamental to know the status of the items and put them on the adequate place. To know where a workflow item will be placed, one should know the stages necessary in turning a request into a finished product. In this way, an item could be placed in one of the following columns:

- Ready to Start
- Waiting
- Working
- Testing
- Done

Additional columns may be added such as: backlog, story, things to consider, etc.

Step 2: Limiting the Work in Progress

At any moment, there is a limited workforce in the team so the amount of work should be adjusted according to it. Changing a team's focus in the middle of a project is mostly negative, and multitasking may be a reason as well to waste time and money. In the figure below an example is shown with a maximum of 8 people for Analyze, 6 people for Develop and Test activities.



Figure 9: Example of a Kanban Board with Limited WIP "docs.microsoft.com"

Step 3: Controlling the Flow

When it comes to managing the flow, it is about controlling the work, not the people. The movement of work items through the manufacturing process at a predictable and sustainable rate is referred to as flow. The creation of a smooth, healthy flow is one of the key aims when establishing a Kanban system. Instead of micromanaging employees and attempting to keep them occupied all the time, one should concentrate on controlling the work processes and figuring out ways to get work through the system efficiently.

Step 4: Feedback

Implementing feedback loops is a must for teams and businesses looking to become more agile. They guarantee that organizations adapt appropriately to anticipated changes and that knowledge is shared across stakeholders. Every team member should contribute the feedback loops in order to have a smooth flow in Kanban activities. The team should have regular meetings at least weekly to have things under control. It helps to identify available capacity and the possibilities for speeding up delivery. It is done by looking at the Kanban board, with each team member reporting on what they accomplished the week before and what they plan to do in the near future.

Step 5: Develop Collectively

Continuous improvement and long-term change in an organization may be achieved through collaborating on improvements based on scientifically validated methodologies, feedback, and measurements. For building a mentality centered on development through evolutionary change, cultivating an organizational culture where every idea is demonstrated to have good or negative results is critical.

Kanban Metrics

There are various models to measure how the overall activities are conducted during the projects. These models are represented mostly by diagrams. Some of the most important ones are Cumulative Flow Diagram Cycle Time Control Chart. These metrics are typically drawn automatically by the program which the company uses, like Jira, Shortcut, etc.

The *Cumulative Flow Diagram* is a useful tool that gives you a quick overview of your team's capabilities. It is a time-based representation of the cards on a Kanban board. The CFD depicts the amount of cards at each level of the Kanban process or value stream when cards begin in the "Ready" column. The slope of the graph indicates what you're the project's number of cards delivered per unit of time. The higher the slope, the greater this number is. The horizontal x-axis in a CFD indicates time, while the vertical y-axis indicates cards. An example of CFD is given below in Figure 10.

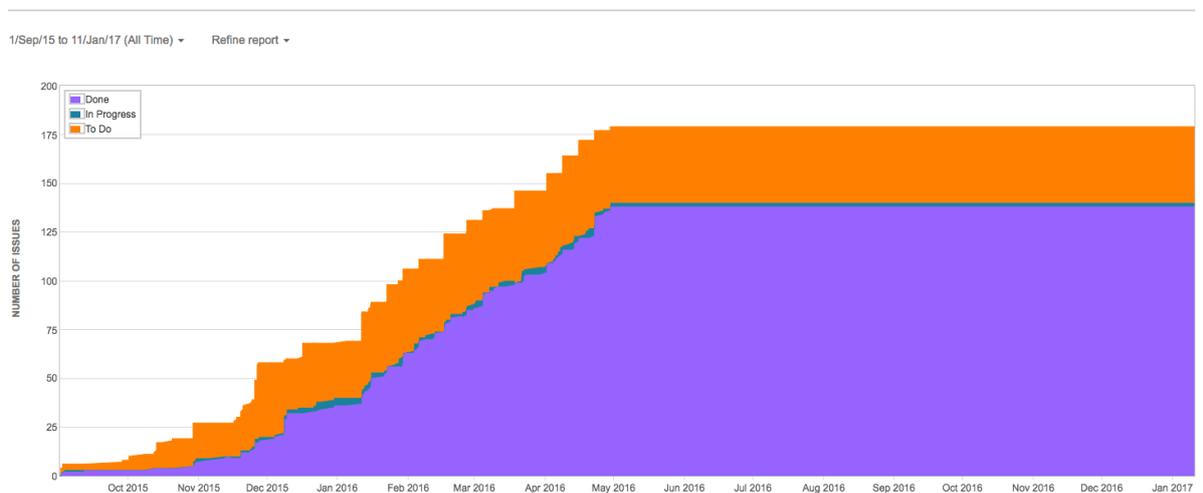


Figure 10: An Example of CFD (<https://support.atlassian.com/jira-software-cloud/docs/view-and-understand-the-cumulative-flow-diagram>)

The *Cycle Time Control Chart (CTCC)*, on the other hand, helps to understand if the processes are un control. As the name implies, it is a control chart, thus, it has two statistical limits which are Upper Central Limit (UCL) and a Lower Central Limit (LCL). Between UCL and LCL there is the

centerline which has a value that corresponds to the average of the points. An example of a Cycle Time Control Chart is given below in Figure 11. Further explanation will be given at the chapter dedicated to Configit charts.

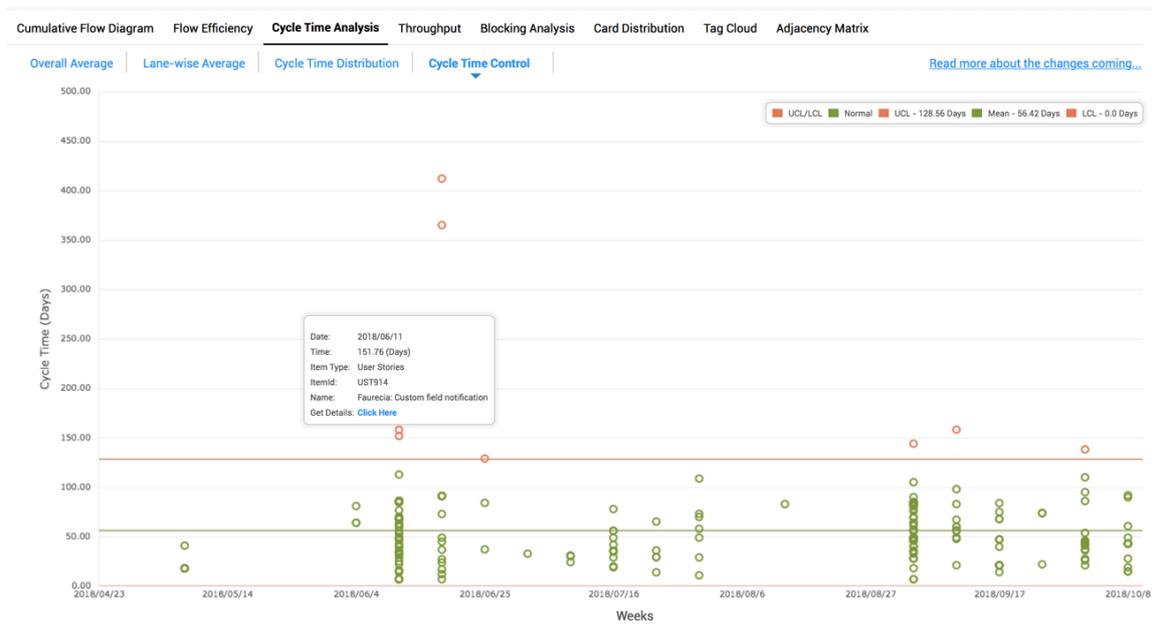


Figure 11: An Example of a Cycle Time Control Chart (<https://www.digite.com/kanban/kanban-metrics>)

There are many graphs that could be drawn only by looking at the Kanban board. CFD and CTCC are the most considered ones for the companies because they are mostly interested in how many cases are solved in how much time. This way, the managers monitor how efficient their teams work. Some of the other graphs are: Cycle Time Distribution Chart, Average Cycle Time Chart, Flow Efficiency Chart, Blocker Analysis Chart, Time Tracking Report and so on.

Pros and Cons of Kanban

Advantages of using Kanban:

- **User-friendly**

Kanban is a very basic and easy-to-understand method that is useful for a company's management to implement efficiently. Working with the Kanban method does not require you to be an expert. The ease of use makes it possible to adopt itself to any kind of project from manufacturing to programming.

- **Improvement in the organization:**

The Kanban method not only uses rules and cards, but it also uses visualizations of process outputs to make job analysis simpler. This might draw attention to other potentially risky places that require further attention.

- **Flexibility:**

Kanban promotes maximum adaptability, which is ideal for larger projects with frequent changes. The method is used all over the company from manufacturing projects to IT development projects.

- **Teamwork:**

Kanban promotes collaboration by requiring the entire team to work together to achieve the best results. It can also be used individually, but the best results will show when used as a team.

- **Low-cost applicability:**

When compared to other project management methods, supervision of the usage of a Kanban board, cards, and output analysis is easier. Thus, making it a low cost, indispensable method. It is also one of the most used technique used all over the globe.

- **Reduces expenses and waste:**

Kanban stands out by exposing and resolving process problems. The Kanban system improves flow and management by assisting the organization in using its current systems, such as just-in-time and make-to-order, to reduce carrying and holding expenses.

- **Enhanced Predictability:**

After constructing a Kanban board, it is easy to study the process in detail with flow metrics and begin collecting work items on it. Monitoring the amount of time tasks spend in the workflow will help you better forecast how much work you can do in the future. Understanding the constancy of your delivery rate can help to make more accurate estimates and decisions based on past data. This will give the possibility to estimate a time and some important barriers which may occur throughout the project.

Disadvantages of using Kanban:

- **Less Effective in Shared-Resource Situations:**

The Kanban procedure could be considered ineffective due to irregular demands. For example, if your upstream production line produced a large number of parts, your demands for additional parts required by the downstream line will require the use of a buffer to avoid the insufficiency for the client.

- **Changes in project composition or demand**

The Kanban method is based on predictable, repeatable production schedules. Demand and product fluctuations may have an impact on the Kanban system's operation. As a result, the method is less suitable to sectors with varying product quantities and mixtures.

- **Variability is not eliminated by the Kanban system.**

If the project is disturbed with long and unplanned downtimes, the Kanban system may create low-quality outputs that must be reworked or rejected. Kanban is designed to control traffic flow in order to satisfy customer demands by indicating when to start, halt, or slow down the activity. Any variation or unpredictability will have an impact on the system's operation, causing it to give mixed, misleading signals about the production levels.

As it is realized, most of the inconveniences of Kanban are due to demand change at the downstream. This is a situation that comes up very frequently in a company. Clients sometimes would like to change their requests for various reasons such as making the project more efficient. However, none of the project management methods is fully capable of adjusting itself according to the sudden changes or requirements. If this concern is neglected -which cannot be neglected in real business life- Kanban would be an almost perfect method to develop projects.

Kanban in Configit

Kanban is a method that is applied effectively in Configit project and it is considered the core method, thus making it the most important one depicted during this report. It is considered fundamental because it can be observed and showed with real evidence. This report contains real screenshots of the Kanban board of the Configit project making it easy to observe a real-life project. Some of the information related to the people involved in the project or to the project itself may be deleted or censored in order not to violate the law against the protection of privacy or as a preference of disclosure for Iveco.

During the project, IT department of Iveco uses Kanban method within the Jira software, by Atlassian. Jira is part of a set of tools for managing work in teams of various sizes. Jira was created with the intention of serving as a bug and problem tracker. But now it is developed into a robust task management platform for a variety of applications, ranging from requirements and test case management to agile software development. It is used online and provides scrum and Kanban boards. Tasks are connected to customizable workflows in boards, which are task management centers. Boards give visibility into the status of each work item and transparency across teams. Teams may precisely evaluate their work efficiency by using time tracking features and real-time performance reports and various types of charts. Therefore, making it very easy to understand at which point in the project the team is and what is left to complete all the tasks. Then, Jira may be used to address the small issues and bugs, which is currently the case for Configit project.

As December 2021, the team still uses the Kanban board to fix the bugs and minor issues like the malfunction of the software or little improvements asked from various departments using the software. In the following, some screenshots directly taken from the Jira software dedicated to Iveco are shown.

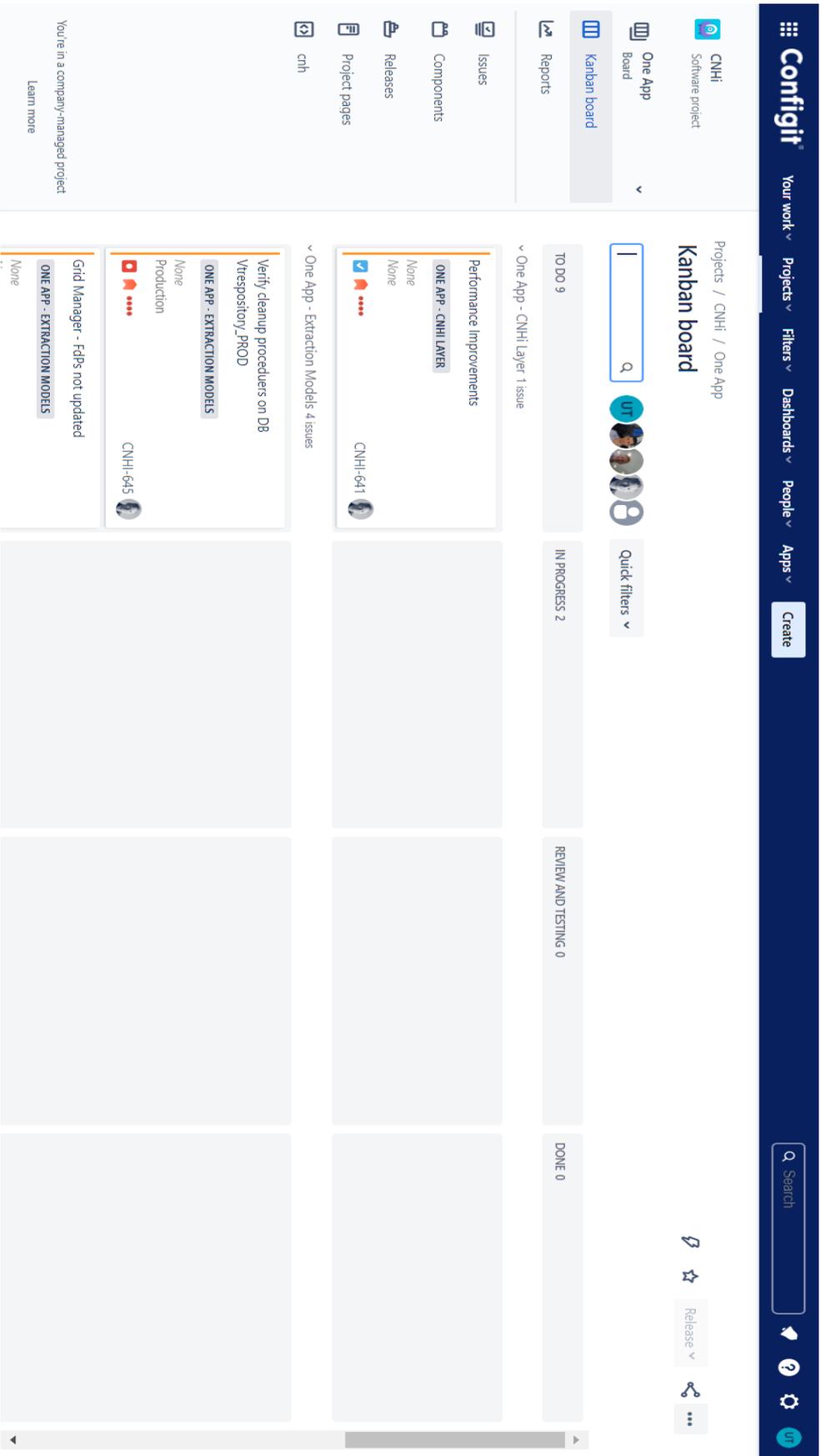


Figure 12: Screenshot of Kanban Board for Configit

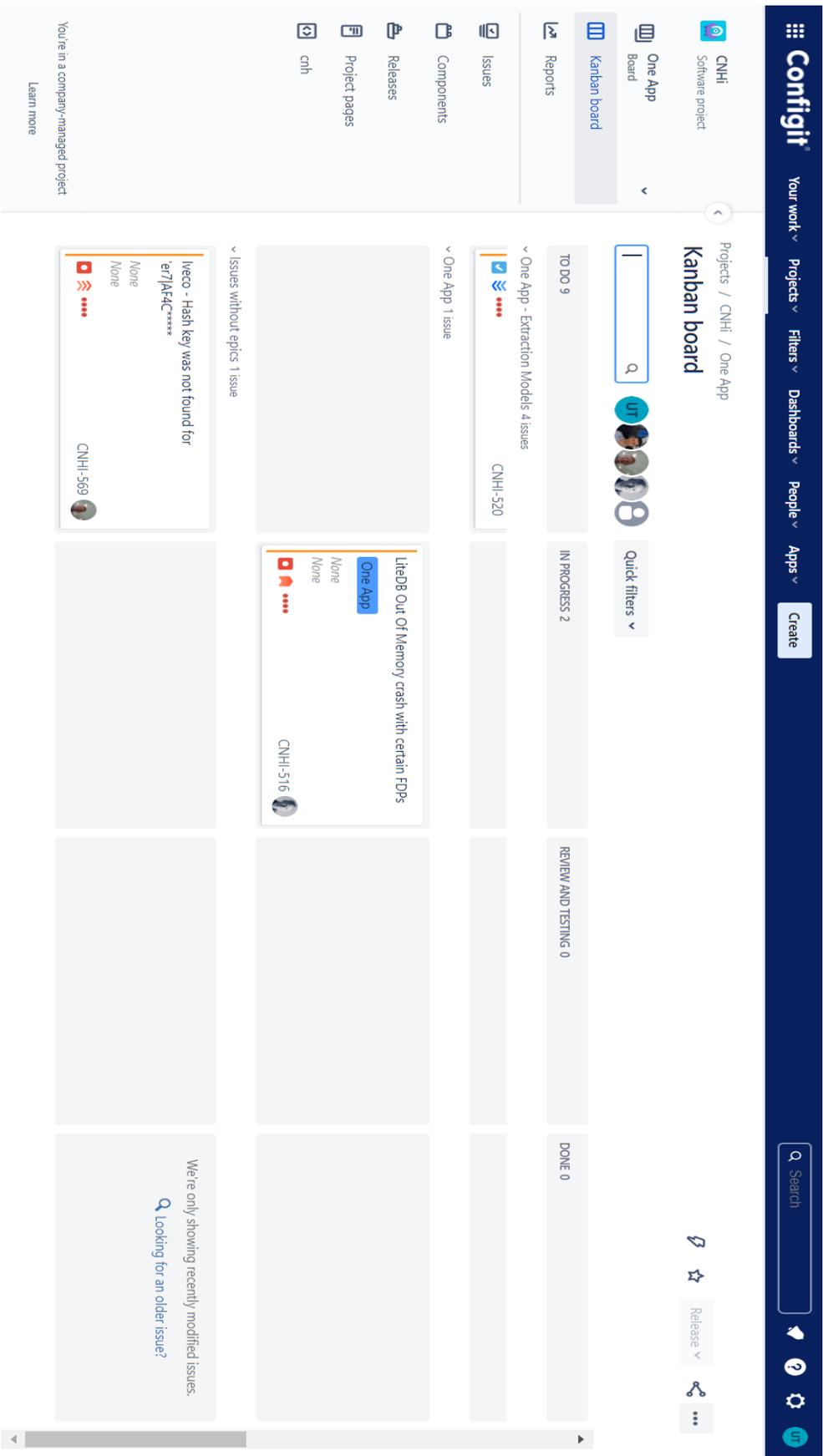


Figure 13: Screenshot of Kanban Board for Configit

In the Figure 12 and Figure 13, there are two screenshots of the Kanban boards related to Configit project. As mentioned, Jira software is used and it looks like this. It is remarkable that there are many Kanban boards for this particular project. Some other projects may have less or more Kanban boards. As it is seen, four columns are present in the Configit Kanban boards: "To Do", "In Progress", "Reviewing and Testing" and "Done". It is mentioned before that the Limited WIP is very important for the Kanban boards but in the figures, it is seen that it is not present. This is due to Iveco's IT department structure. There are lots of people working in many projects thus, the people working for the projects are divided in sub-categories. It is seen in the figures that only four people (excluding UT for Utku Tuncel) have access to this Kanban board which constructs one of the sub-categories mentioned before. This way forces to have many Kanban boards and makes using Limited WIP useless since just a few people in the group will be working for all the tasks.

One can observe that the Figure 12 contains the problems/tasks coming from the client, such as improvement of performance. Since Configit is already released, people are actually using it and giving feedback to the IT development team to improve the application in order to work efficiently as soon as possible. Because when the first edition of a software is released, even the biggest companies like Apple and Google will have problems and bugs in the applications. In our case, these are the problems noticed by the users of Configit from various departments like Product Databank, Order Management and so on. By using the Configurator, the departments experience some malfunctions, some additive features that they would like to have in the application (it costs more to add features) or they simply want to make it better-looking by improving the aesthetics. Since Configit is an internally used software (not used by dealers), the functionality has more priority over aesthetics. Thus, a separate Kanban board is created for this very important job.

On the other hand, the Figure 13 shows that the tasks are named as "Lite DB out of memory..." and "Hash key was not found...". These tasks sound like they are more technical problems rather than client problems. In fact, this second Kanban board is used to address the technical problems and issues that has to be solved. Also in this figure, it is seen that the same four people are working for this Kanban board. This is also an indication that shows different Kanban boards for different purposes are used for the same project.

Clicking on the "Create" button, one of the four people which has access to view this board can create tasks and submit it. The task(s) will show up under the "To Do" section. Then a person can work and put comments on it while doing the task. Once the task is ready to move to another section, it is dragged. All the complete tasks can be seen under the "Done" section. In the Figure 12 and Figure 13, these tasks may have been hidden in order to avoid confusion or for other reasons, but they can be shown by using the search function.

On the left of both figures, a button is present with the name "Reports". When it is clicked, a page appears with some charts and reports. Cumulative "Flow Diagram" and "Control Chart" for **Agile reports**. "Average Age Report", "Created vs. Resolved Issues Report", "Pie Chart Report", "Recently Created Issues Report", "Resolution Time Report", "Single Level Group By Report" and "Time Since Issues Report" for **Issue Analysis reports**. "Time Tracking Report", "User Workload Report" and "Version Workload Report" for **Forecast & management reports**. Many other reports are present under the **Other Reports** section. All these report types are very useful to present the percentages of the issues solved, the time consumed for the tasks to be completed, the workload on a single worker and so on. These reports are also used in the meetings and the presentations to show the to the clients or the superiors. Some of the important reports are shown in the following.

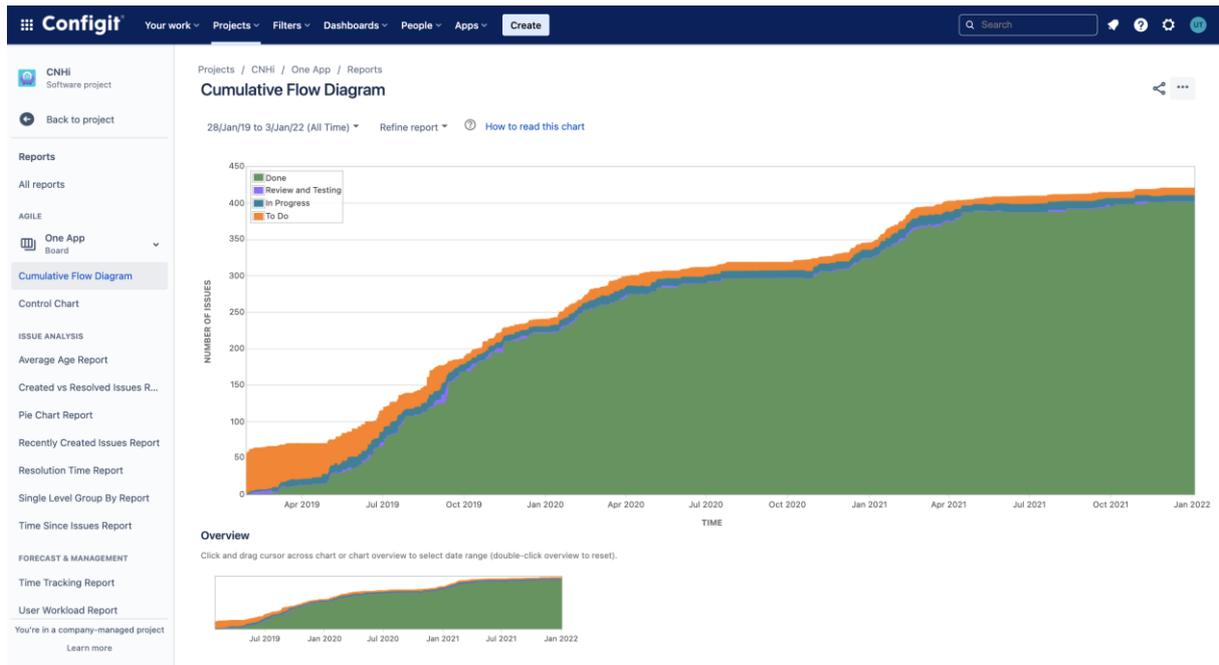


Figure 14: Cumulative Flow Diagram Report of Configit

Figure 14 indicates the “Cumulative Flow Diagram” of Configit project from April 19’ to Jan 22’. The orange color indicates the new tasks (“To Do” column), the blue color indicates the ongoing tasks, the purple color indicates the tasks in phase of testing and the green color indicates the complete tasks. Cumulative Flow Diagram shows the statuses of issues over time. This helps the user to identify potential bottlenecks that need to be investigated. For instance, from April 19’ to September 19’ it is observed that the orange color is wide which means there are many “To Do” tasks. This is due to the fact that the project is just created and there are a lot of demands from the client side (which is again Iveco for Configit case). Following that, from April 20’ to December 20’ it is seen that there is a phase that the graph is almost straight. This may be due to many reasons but in this case, probably there are long-lasting tasks which creates a bottleneck in the project flow. The first version of Configit was launched to Product Databank department on March 21’ which means that this bottleneck period is before the launch of Configit. Consequently, this may imply that those tasks are more likely to be long-lasting tasks.

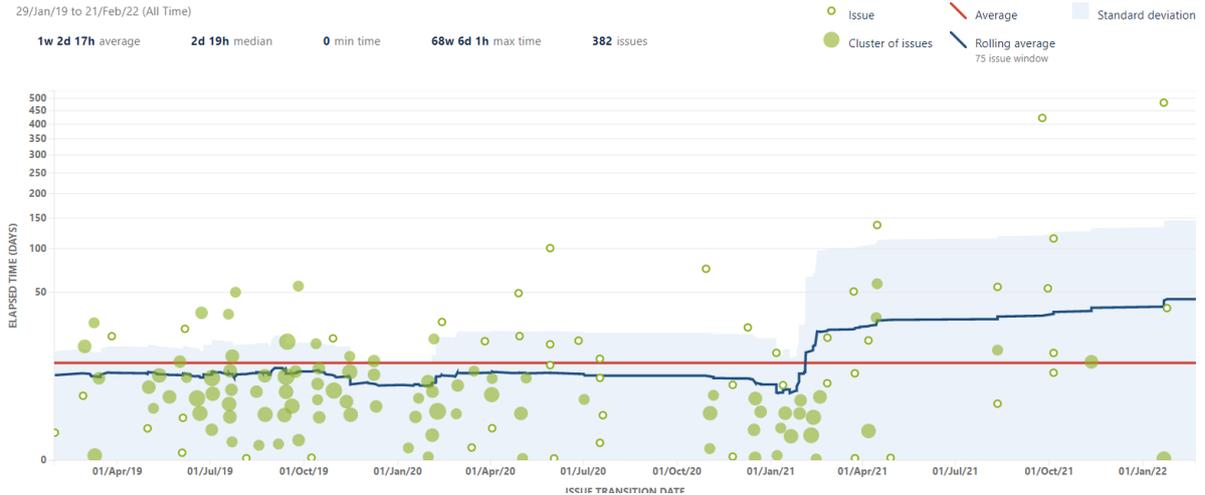


Figure 15: Cycle Time Control Chart of Configit

The chart in Figure 15 is called Cycle Time Control Chart. Before at the definition chapter, some definitions were given. In addition to that, it is worth mentioning about the distribution. When a process is in control, generally, the data is normally distributed which means 99.7% of the data will fall within the $\pm 3\sigma$ control limits. When data points exceed this control limit, investigation is carried out to identify and delete data owing to "special reasons." After that, the processes will be controlled and improved so that even common cause variation could be decreased. This particular chart is a screenshot taken from Jira's interface within the page dedicated to Configit. The red line in the middle shows the media of the time to solve issues. The blue line represents the media of this data moving in time. To make the analysis focused on the time that the issues are solved, Jira provides a moving standard deviation which is the highlighted blue part. Finally, the green dots and circles shows the issues, also referred as the cards on the Kanban board. It is seen that there are some outliers for the Configit project. However, the reason behind this must be interrogated in order to eliminate these outliers or make the process better. Also, some of the issues in an IT project might take longer that the other. Therefore, this graph might not be considered as a main concern. Alberto Russo also, implies that his team does not follow this graph closely.

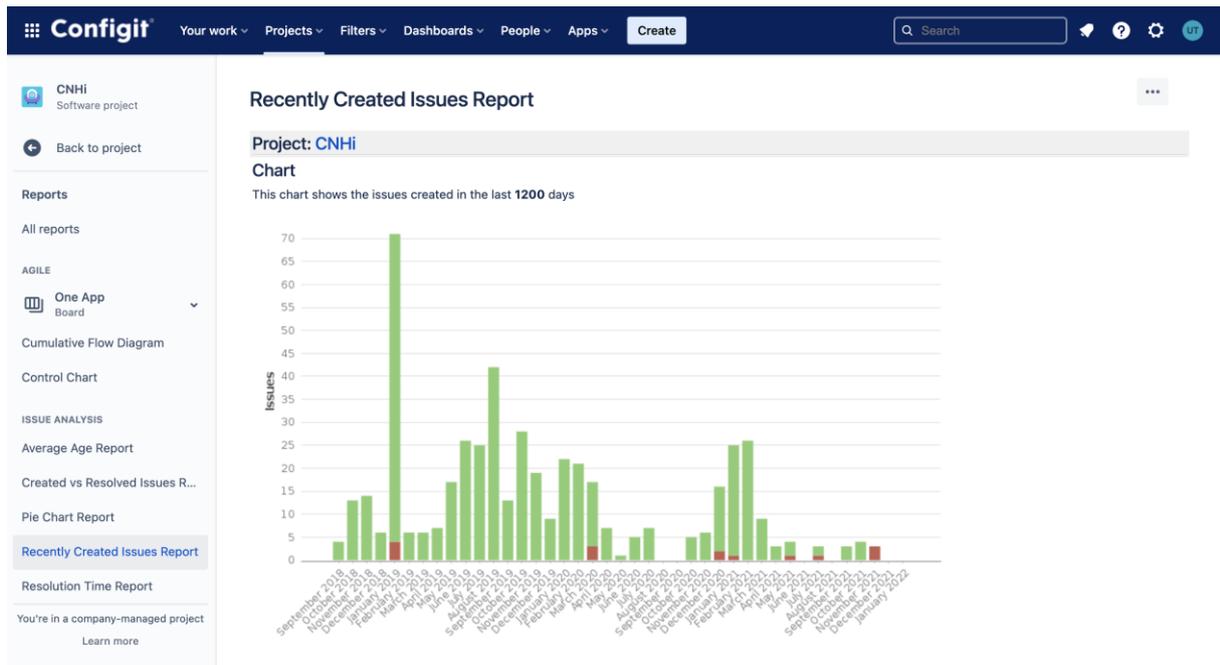


Figure 16: Recently Created Issues Report of Configit

In Figure 16, “Recently Created Issues Report” is depicted. This report shows the number of created tasks (total), resolved tasks in green color and unresolved tasks in red color. This report can be useful to represent how much of the assigned tasks are completed in a visual way or to see business of the team by looking at it. However, some tasks are more time-consuming or more complex than the others, thus, it is not very correct to think that the team is busy or not just by looking at the graph. The team leader (generally the project manager) must be consulted to jump to conclusions.

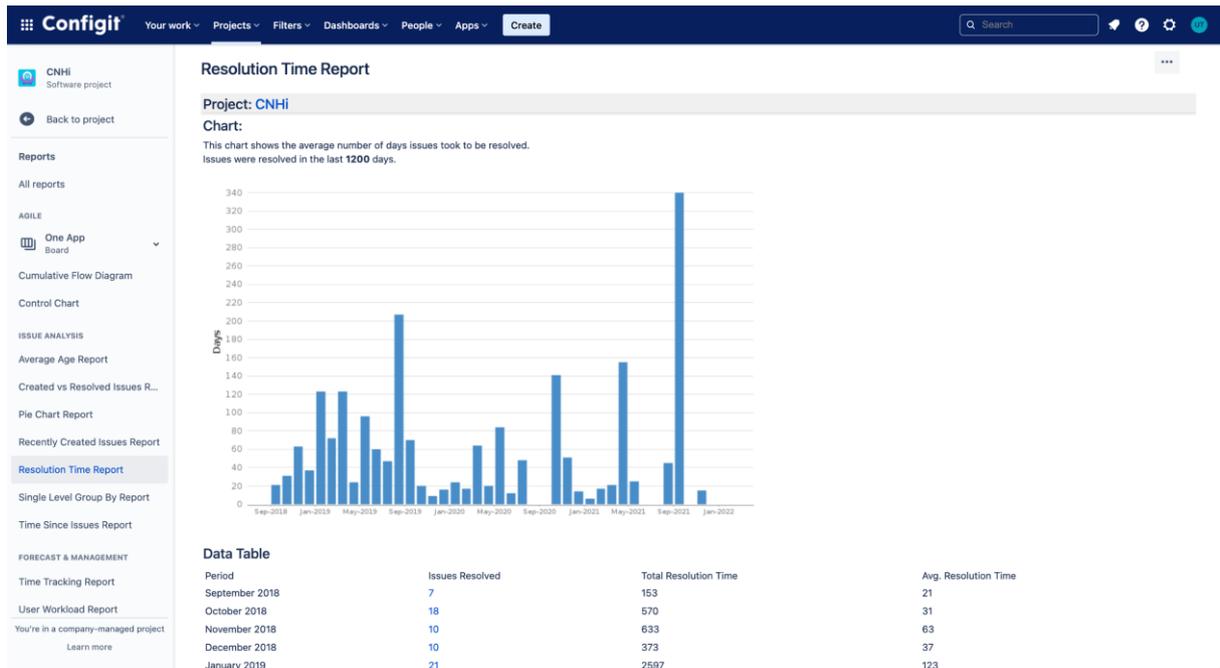


Figure 17: Resolution Time Report of Configit

In Figure 17, “Resolution Time Report” is represented. This report is particularly useful to understand the time spent on a task. When clicked on one of the bars of the graph, all the tasks under the time interval selected will appear in another page and it will be possible to investigate them in detail. This way, the project managers will be able to report their superiors or inferiors, indicating which kind of tasks need more time, if they need other members to the team or for specific tasks or so. Furthermore, under the graph it is possible to see the total resolution time and the average resolution time of tasks for specific time intervals.

In conclusion, these reports are useful to see any change in the workflow and the project flow. All the mentioned and many more kinds of reports can be derived from the use of Kanban board functionality of Jira software and this is why most of the companies nowadays use Jira. On the other hand, it is seen that the Kanban method among the project management techniques is efficiently applied and found useful in Configit project.

4.3 Scrum Methodology

Scrum is an agile development approach based on iterative and incremental procedures that is used in the creation of software. Scrum is an agile framework that is meant to offer value to the client throughout the project's development. It is adaptive, rapid, flexible, and effective. Scrum's main goal is to meet the needs of the customer by establishing a culture of open communication, shared ownership, and continuous improvement. The development process begins with a rough understanding of what needs to be produced, followed by the creation of a set of qualities sorted by precedence that the product owner desires.

The word "scrum" comes from rugby and it is created when a foul happens in the game. Two teams gather and all the players make a chain of people to push against the opponent team to take the ball to their sides. With scrum we mean opposing the obstacles to achieve the final product or service as a team. Scrum in project management is a framework that helps teams work together encouraging teams to learn through experiences, self-organize while working on a problem, and reflect on their wins and losses to continuously improve. It is used mostly for software development teams but can also be implemented in various sectors exploiting teamwork. Scrum is a combination of gatherings, methods, and roles that assist teams organize and manage their work. It's sometimes referred to as an agile project management framework. People frequently confuse scrum and agile since scrum emphasizes continuous improvement, which is also a central principle of agile. Scrum, on the other hand, is a work-flow structure, whereas agile is a mentality. In this report, the defined scrum methodology is the model which is more likely to be adopted to the software development because the information mentioned in the definition part will then be showed with evidences in Configit project.

Historically, scrum was first mentioned in the Harvard Business Review article "The New Product Development Game" by Hirotaka Takeuchi and Ikujiro Nonaka in 1986. This article explains how manufacturers like Honda, Canon, and Fuji-Xerox use a modular and collaborative approach to product development to develop new products all over the world. The necessity of enabling self-organized teams is emphasized in this strategy.

Scrum Artifacts

Before knowing about the process of the scrum, there are some terms that one has to be familiar with. These terms, also referred as artifacts, can be seemed like tools that help to solve a problem. These artifacts are like the following: a product backlog, a sprint backlog, and an increment.

Product Backlog

The product manager maintains the product backlog, which is the principal list of work that has to be completed. This is a live list of features, needs, upgrades, and fixes that the sprint backlog uses as input. It's simply a "To Do" list for the team. Because items may no longer be relevant or issues may be handled in different ways as we learn more or as the market evolves. The Product Owner revisits, re-prioritizes, and maintains the product backlog on a regular basis.

Sprint Backlog

The Sprint Backlog is a collection of items, user stories, or bug patches chosen for implementation in the current sprint cycle by the development team. The team decides which items from the product backlog to work on for the sprint at the sprint planning meeting (which will be mentioned later). A sprint backlog might be flexible and change throughout the sprint. However, the primary sprint goal (what the team wishes to accomplish in this sprint) cannot be compromised.

Increment

The increment (or Sprint Goal) is the usable end-product from a sprint. It is the sum of all the tasks, use cases, user stories, product backlogs and any element that was developed during the sprint and that will be made available to the end user in the form of product.

Scrum Roles

There are three fundamental roles to establish a functional team according to the scrum methodology.

Product Owner

The product owner is the person who represents the stakeholders and consumers who will be using the final product. They concentrate on the business side of things and are in charge of the project's return on investment. They communicate the project's vision to the team, verify advantages in stories that will be added to the Product Backlog, and prioritize them on a regular basis. The product manager is not usually the same as the product owner. Product owners are responsible for making sure that the development team adds the greatest value to the company. It's also critical that the product owner be a unique individual. No development team likes to be given contradictory instructions from different product owners.

Scrum Master

The individual in charge of leading the team and ensuring that they follow the methodology's procedures and principles. The Scrum Master is responsible for maintaining Scrum up to date, as well as offering coaching, mentoring, and training to the teams as needed. A competent scrum master has a thorough understanding of the team's work and can assist them in improving their clarity and output efficiency. He/she arranges the essential

resources for sprint planning, stand-up, sprint review, and the sprint retrospective as the group leader.

Team

A team of experts with the appropriate technical skills who work together to build the project and complete the objectives they commit to at the beginning of each sprint. Each sprint's strategy is driven by the scrum team. Using their previous velocity as a guide, they anticipate how much work they expect they will be able to do throughout the sprint. The team receives valuable feedback on their estimating and delivery process by maintaining the iteration duration constant, which improves the accuracy of their predictions over time.

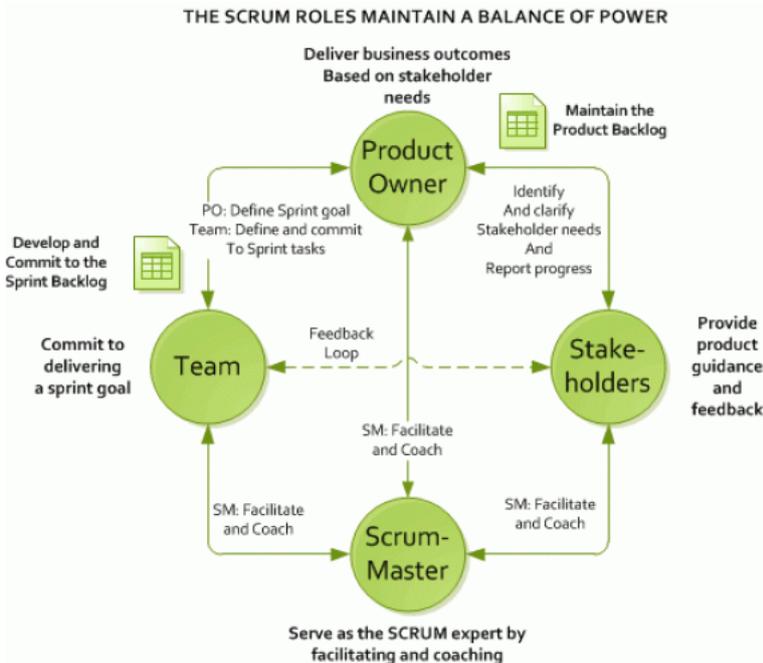


Figure 18: Scrum Roles Scheme

Figure 18 shows the relationship between the scrum components and the stakeholders. As it is seen, there is an information flow between every component. This helps the team to reach a greater value for the project with maximum efficiency.

Scrum Events

Scrum is carried out in short, periodic intervals known as Sprints, which normally last between two and four weeks and are used for evaluation and feedback. Each Sprint is a self-contained unit, delivering a full result, a variant of the end product, that must be supplied to the end-user with the least amount of work feasible when asked. A collection of needs and goals that build the project plan serves as the beginning point for the process. The project's customer prioritizes these goals based on a balance of value and cost; this is how iterations and subsequent delivery are defined. In this section, series of events carried out during the scrum methodology are analyzed. It is very important to recognize these events in order to understand and implement the scrum effectively. The following list is ordered such that a person can follow it respectively to apply it on a project.

Organizing the Backlog

This event, also referred as "backlog grooming", is the product owner's duty. The major responsibilities of the product owner are to steer the product toward its goal and to keep a continual eye on the market and the client. Consequently, he/she keeps this summary using user feedback and the development team to help prioritize and ready to be worked on at any time.

Sprint Planning

The purpose of Sprint Planning is to identify what will be accomplished in the Sprint and how it will be accomplished. This discussion occurs at the start of each Sprint and defines how the project will be managed based on the Product Backlog phases and deadlines. Each Sprint has its own set of characteristics. The work that will be performed during the current sprint is planned during a meeting by the team. This meeting is driven by the scrum master and it is the phase in which the sprint goal is decided by the team.

Sprint

A sprint is a core unit work of a team. It is the primary element that distinguishes scrum from other agile development approaches. A sprint is the span of time during which the scrum team collaborates to complete an increment. A sprint is typically two weeks long, however this might vary depending on the project's duration and complexity. Shorter sprint time intervals are often recommended for more complicated work/projects. If required, the scope of the project might be revised between the product owner and the development team during this time. Sprint is a specific and an important function of scrum that differentiates it from other methodologies.

Daily Scrum

The Daily Scrum's goal is to assess the progress and trends until the Sprint's completion, synchronize activities, create a strategy for the following 24 hours, and ensure that everyone is on the same page. While the Scrum Master should attempt to resolve any issues or roadblocks that occur. During the Sprint phase, a brief meeting is held each day. This meeting is sometimes known as a 'daily stand-up,' implying that it should be brief. Individually, three questions are answered:

- What did I do yesterday?
- What am I going to do today?
- What help do I need?

Sprint Review

The sprint review's purpose is to highlight what activity has been performed on the product backlog in preparation for future delivery. The completed sprint is evaluated, and there should be a visible and demonstrable improvement in the product to show the end-user. The development team presents the 'Done' backlog items to stakeholders and colleagues for feedback. The product owner has the option of whether or not to release the increment.

Sprint Retrospective

The team goes through the sprint's completed goals, identifying what went well and what went wrong. From the standpoint of the development process, this stage is used to implement improvements. The sprint retrospective's purpose is to identify potential process changes and create a strategy to implement them in the following Sprint. It may be conducted as a meeting including the scrum master and the product owner. During the meeting, the scrum master will tell what may be improved for the upcoming sprints.



Figure 19: Scrum Process Scheme

In Figure 19, a scheme sums up what is described in this chapter. A visual projection of what explained might be helpful. As it is seen, the Product Owner gets the information about the user stories and the product vision of the product in order to create a Product Backlog. Consequently, Product Backlog is forwarded to the Scrum Master to create a list of set of activities which then will lead to the execution of the operations by the Development Team. Once the sprint is completed, the Daily Stand Up takes and the client perceives the advancement to give instant feedback to the team. The cycle repeats itself every time interval which is defined by the Scrum Master.

Scrum Pros and Cons

Pros of Scrum

- Scrum procedures are iterative and handled within particular work times, making it simpler for the team to focus on certain functionality for each period. This not only results in superior deliverables tailored to the demands of the user, but it also allows teams to increase units in terms of functionality, design, scope, and characteristics in a systematic, clear, and simple way.
- Scrum enables an environment that any expectation can be directly imposed to the project with precision. The customer creates their expectations by stating the value that each project requirement offers, the team evaluates them, and the Product Owner prioritizes them based on this information. The Product Owner validates that the criteria have been satisfied on a regular basis during sprint demonstrations and provides feedback to the team.
- The bullet-point before leads to this point: Rapid response to changes in requirements brought on by consumer needs or market trends. This is why the technique responds to the shifting demands that come with complicated projects.
- All these points combined; it is inevitable that the scrum methodology decreases the time-to-market.
- Exploiting scrum methodology, it is possible to estimate the average speed of the team by sprints, with which, consequently, it is possible to foresee when a certain functionality that is still in the backlog will be available. This will also help us determine the finish date of the project.
- Knowing the speed of the team and the most important functionalities of the project, helps to clear the risks to a minimum level or at least to foresee them.

Cons of Scrum

- It is required significant training. Although the Scrum methodology has the ability to offer speedy and high-quality solutions, successful implementation needs a well-trained and skilled workforce. For a project to be successful, everyone on the team must grasp the benefits and unique characteristics of Scrum before committing to it. This applies high costs and waste of time, thus, reduction of operational time at least for the members of the team which are newly adopting to this model.
- Scaling may be tough. Scrum implementation on a larger scale necessitates intensive training and exact coordination, making it difficult to use for large projects. Although there are approaches to adapt Scrum to larger projects, they are typically difficult to understand and apply.
- It does not affect the project's deadline. Although using the Scrum process includes lots of smaller deadlines for everyone involved, it does not provide any benefit in fulfilling the project's ultimate deadline. Although this method raises the chances of everyone involved working to their full potential and satisfying expectations, the project manager and stakeholders must also ensure that the project is on schedule.
- It requires the usage of small groups. The Scrum methodology works best with groups of at least three but no more than ten people. While this might encourage cooperation and teamwork, some businesses may find it challenging to reorganize their personnel into teams.

Scrum in Configit

In development phase of Configit, it is again used the Atlassian's Jira software. As mentioned before, Jira software is one of the most known and powerful tools for Agile methodologies, especially for software development. Jira provides tools for Kanban, Scrum or customized solutions and tools for their customers from agile boards, backlogs, roadmaps, reports, to integrations and add-ons you can plan, track, and manage all your agile software development projects from a single tool. Even though Jira is used for Configit project, it is seen that the procedures are not followed and the methodology is not applied effectively. It is mentioned in the previous chapter that this is not the case for Kanban methodology. This chapter will analyze how much Scrum is applied, how much is not applied and why it is not effectively applied during the Configit project.

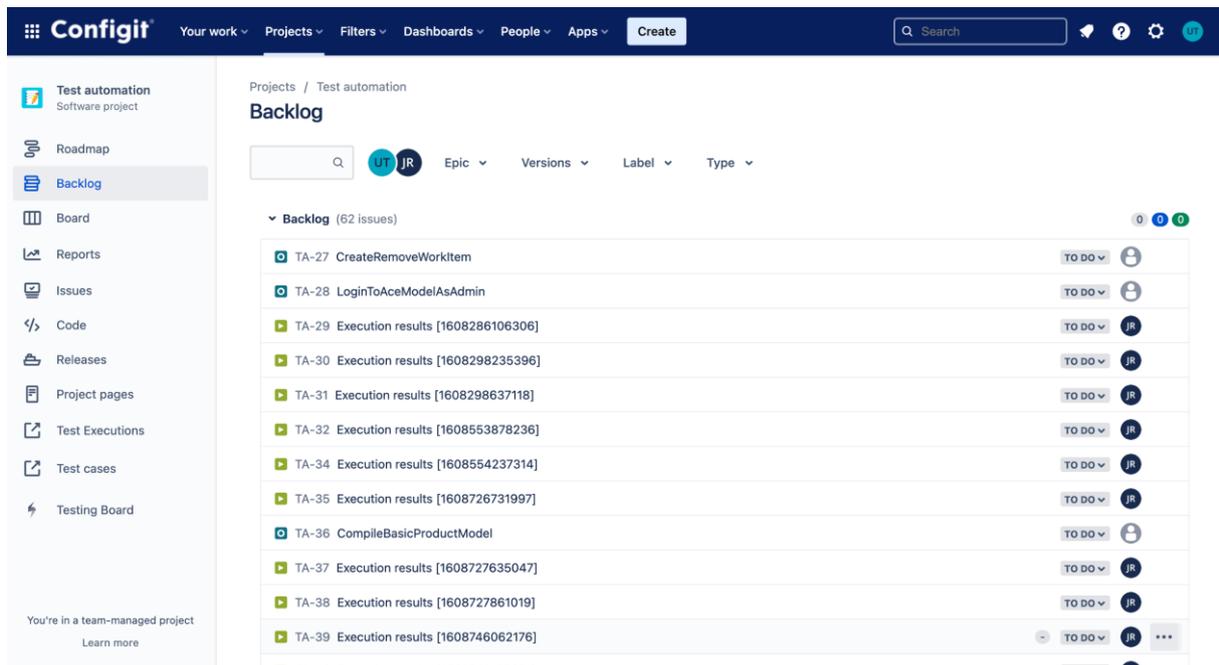


Figure 20: Screenshot from Jira, Backlog Page of Configit

As seen in Figure 20, the backlog of the software is constructed correctly by the person with name initials "JR". JR is the scrum master as Alberto Russo, the project manager implies. As January 2022, this is a recent version of the backlog, thus, the basic requirements and customer needs of the program are not present on this page. On the top, we see that only one person is the contributor to create backlog content. The reason behind it is that JR takes the information coming from the user (for Configit the users are the central workers of Iveco) and put this data on this backlog page of Jira. Then, this backlog will be submitted to the team. As seen in the figure, the content is named like "CompileBasicProductModel", "ExecutionModel" and so on. These names look like they are created with the intent of improving but not creating a software and this is the case for Configit. Indeed, lately, Configit is being adopted to the end-user by adding little features and minor upgrades.

As for the Scrum, is seen that during the Configit project the first part of the methodology is followed correctly with the Jira. However, the remaining part of the scrum methodology is not followed with a lot of care, at least within the Jira software. The problem in the Configit project is that putting all the data related to the sprints, planning meetings and daily stand-up can get overwhelming sometimes. Thus, some of the companies refuse to follow every step of the project management methodologies precisely. But this does not mean that the main principles are not followed. For example, in the Configit project, the sprint time is defined as 2 weeks and it is strictly respected by the team. Every two weeks the team gathers and have a sprint planning meeting to define what in this period of time will be accomplished. At the end of the sprint, as well, the team has a sprint retrospective meeting in order to understand what went well and what went wrong. The daily scrum step, on the other hand, is not strictly respected but the team have individual brief meetings on the daily basis to make things clearer with the project manager, Alberto Russo.

As mentioned when explaining the pros and cons of the scrum, this methodology is not very adequate for large-scale project. Indeed, Configit is not a very large-scaled project with respect to the other projects and it is managed by a small group of people. However, Configit is backed-up from a big company and it is actually an outsourced software with highly customized structure. This makes things easier and leaves the development team fewer things to do about the software.

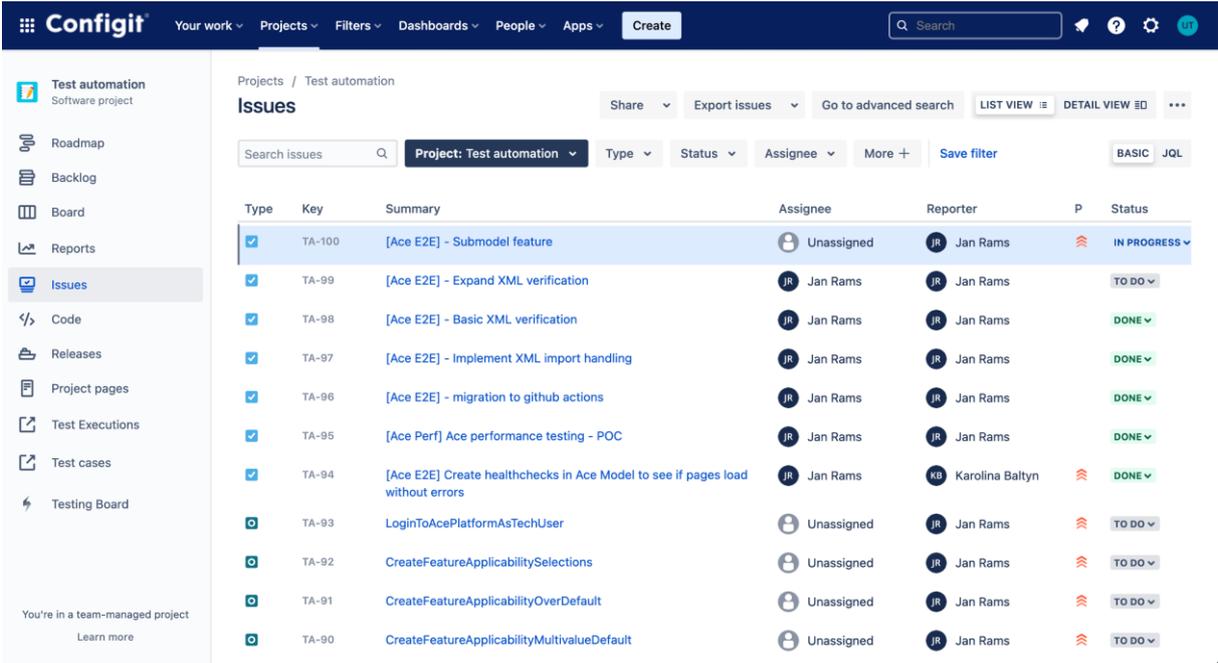


Figure 21: Screenshot of Jira, Issues page of Configit

As seen in Figure 21, the issues are effectively inserted on the Jira software, making problems very tricable.

In the following chapter, an interview with Alberto Russo is given to understand in depth how these methodologies are followed from a point of view of the project manager of the Configit project.

Jira tool also provides some graphs which are very useful from the point of view of accomplishments. These graphs can be found within most of the programs built for scrum. They help to organize their activities, understand how much work they completed and how much they still have left, the effort that the team has put, etc.



Figure 22: Graphs Related to Scrum Process

In Figure 22, it is observed the three essential graphs for the scrum process. From left to right, the graphs are: Burndown, Burnup and Velocity, respectively. Burndown graph is used often at the sprint level. It lets team members to see what has to be done and provides a visual overview of the whole development cycle. Burnup graph shows how the quantity of completed work has changed over time. The work that has already been completed is shown by one line, while the release perimeter is represented by the other. Velocity graph instead, illustrates how much work a team can put in to finish all of a sprint's tasks. A specified amount of "points" is used to represent velocity. This graph is particularly useful for planning purposes.

In Configit project, it is already mentioned that every step of the scrum methodology is not completely followed. Unfortunately, even if the graphs are present on the page dedicated to Configit in Jira, they are empty. This is because PM or the scrum master do not fill out the sprint boards in the tool. Eventually, this fact can be considered as evidence that Iveco does not effectively benefit from the scrum methodology.

5. Interview with Alberto Russo (Project Manager of Configit)

Date of interview: 14-01-2022

Q: Please introduce yourself, Alberto.

A: I am Alberto Russo. I'm an IT project manager working in CNH Industrial in the product definition and configuration area. I'm responsible for the procedures related to the product definition in SAP and with the integration of the configurator provided by Configit. I'm also accountable for the pricing procedures and all the other processes related to the product classification. I started working as a project manager in 2013 with the project aim to replace the dealer application portal called "The Equipment" and with the realization of the first price and quote application used by salesman to collect offer and transfer these orders to the equipment portal.

Q: You give support also to CNH Industrial not just Iveco, right?

A: Yes, exactly. Till June, I will be supporting to Iveco about the Configit project but after that, with spin-off, I will be fully giving support to CNH Industrial.

Q: From which path you became a project manager?

A: I started working as a consultant and a programmer in 2004 in a consultancy company which gave support to Iveco, when Iveco was called Fiat Industrial. I was following a software used for the order entry in the vehicle management process in SAP. I worked at this position for 6 years, till 2010, as a programmer. Then, CNH Industrial started using SAP as well and I was a part of the project as a *senior programmer*. By 2012, I completely abandoned the programming activities and I was dedicated mainly on project management. We started working on the replacement of the product configurator called IPC. And then after a quite long and deep analysis on the market, we decided to adopt the solution provided by Configit. We launched it in 2012 for CNH Industrial to be used for agricultural and construction equipment products. Then, Iveco decided to

implement the Configit configurator replacing the IPC, after seeing the success of the program with CNH Industrial. Therefore, I started giving support to Iveco.

Q: But, as a project manager, do you still use your coding skills?

A: Yes, the programming skill are still needed when you have to analyze the code developed by the programmers. But also, when there are problems or troubleshooting is needed, having programmer skills gives you also the possibility to debug the code. Having a coder mindset allows you to be efficient when you are designing a solution. You can imagine what can be done and how, because you know exactly what is needed on the development side.

Q: Moving on to the Configit and the project management techniques. Why did Iveco choose Configit to work with?

A: As I mentioned early, we made a long market analysis in AG&CE (an IT company giving support for SAP and Configit), that we saw that Configit is a company where its business is totally dedicated to product configurators and they do it very well. Configit is very scalable, fast and behind it, there is a big support team working. Periodically, they release new functionalities and improve continuously. When I was forking for AG&CE, Configit was a quite small company with about 160 employees and as CNH Industrial, we were the first automotive company to adopt their software. Now, they have thousands of employees and half of their business are dedicated to the automotive sector such as Volvo, Jaguar, Land Rover and so on.

Q: Moving to the project management techniques. Which are the terms you are familiar with? Agile methodologies: Lean, Kanban, Scrum, SWOT?

When we started working on the Configit project, we adopted an agile approach. But to be honest, we haven't adopted all the agile methodologies as they are. We are working with a new tool and we have a project with a very high number of features and functionalities so it was not very convenient to work with these development techniques since they require very much attention and following. We use at the Kanban board to define tasks and follow their progress. We use also the scrum methodology in our way. Which is; collecting the backlog data and splitting them up as Sprints. The sprint duration for us is 2 weeks. Then, we release the new functionalities periodically, typically every month. *With Configit project it is easy to implement an Agile approach but with bigger projects such as "SAP rollout", you cannot proceed with these techniques because the type of the solution that you are going to implement doesn't allow you to work with Sprints or with small releases.*

Q: So actually, for Configit you use all of these techniques, but I guess you don't adopt effectively the JIRA software when you're using the Scrum methodology. Correct?

A: Yes, because you need also in the team someone that should be almost fully dedicated on the control of these techniques. And unfortunately, in our team, we don't have that kind of a person. We are also following other projects, so we don't actually have the time to complete the scrum boards provided in Jira. We mainly use Jira for Kanban because it's very helpful. In addition, we use Jira for ticketing, to collect the backlog data for the Sprints and to remember the taken decisions. As I said, we would need a PMO to sort these things for us to fully make profit of the tools provided by Jira.

Q: Do you have all the roles defined in the Scrum? (Scrum Master, Product Owner, Team)

A: Yes, we have a Product Owner, a Scrum Master (JR) and the team, obviously.

Q: Which one of the stated techniques you're using more?

A: I would say Kanban and the ticketing service provided by JIRA which gives the possibility to track the test cases. Then, we use the dashboards to track the evolution of the software. So, we use Jira mainly for IT development but also for the user acceptance tests.

Q: Do you think these the use of these techniques could be improved?

A: Yes, obviously there is always room of improvement. When you finish a project, for the next one, taking advantage of the lessons learned from the previous one is very important. For the next project, it is sure that we will use these techniques more effectively than this one, since we are still learning about it.

Q: What do you think is the impact of IT on these techniques?

A: If they are used in the proper way, they can help you a lot. Especially in the communication, to keep the teams up to date because when you use a Jira you have always the possibility centralize the information, avoiding to exchange tons of emails. Have the information always available and easily tracked. Therefore, I can say that IT tools like this help us a lot dealing with the projects.

Q: Do you think it can be a competitive advantage with respect to the other companies that doesn't use these techniques?

A: Maybe yes. I mean, you can be more effective by using the techniques. But for the competition between companies, it gets a bit tricky. I think competitive advantage depends more on the quality of the product released at the end. On the other hand, if these techniques make you release better products, it can be considered maybe a competitive advantage.

Q: Would you like to know more about these techniques in the in the future?

A: Absolutely, we are already gaining experience doing this project (Configit). I think for the next ones we will know more which tools are very useful and which are not. We will be also following the evolution of the tools like Jira in order to apply them most effectively. So, I can say that we are still in a preliminary test phase using these methodologies and seeking to implement them to the similar projects.

Comments About the Interview

It is seen that spin-off not only affects the company but also the employees of it. Alberto Russo will be leaving Iveco with the spin-off and the person who was in charge of development of Configit will no more be available for the company. There will probably occur some costs related to the new employees who will have to deal with Configit.

Companies are now learning more and more about the project management techniques which ease their lives when launching new projects. The majority of the big companies like Iveco now are using SWOT analysis and Kanban boards all over its projects. As for scrum, it is observed that there

is still way to go. For Configit, it is possible to say that scrum is a very effective, but tiring method. The fact that Configit project has no defined scrum master who has to deal with the sprints and putting all the necessary information on the scrum boards. If such an employee was present, it is unsure if a positive cost-benefit ratio could be obtained. To be sure, the company would have to try putting in charge a scrum master on one of its projects and see if it is really beneficial. This, meanwhile, also is an extra cost that has to be taken charge of.

As for Alberto Russo example, having a technical background, is not an essential requirement for a Project Manager but very useful in order to understand the requirements and the ways to implement. Obviously, a project manager should have some knowledge about the project management techniques and the related tools used for it. A PM that does not know how to use a Kanban board, for instance, would have difficulties communicating with his/her team.

For the Configit example, it is observed that Iveco is trying to adopt the Agile methodologies but having difficulties about the full implementation. According to Alberto Russo, having so many functionalities and features in a program makes it very hard to follow every step of these techniques. He implies that they invented their restricted way of the Scrum. They create the backlog of things to do and split them into sprints. The duration of every sprint for this project is 2 weeks. He also tells that for a mid-size project like Configit, it is easy to work with Scrum, but for bigger projects, it may not be possible to work in this way. As also defined during the definition, scrum method is much adoptable for mid-size projects and for bigger projects, different parts of the projects could be split in order to work with this method.

Nowadays, the impact of IT is significant for the projects. However, these methods are not considered as competitive advantages. They are only considered as secondary activities to create value. In fact, most of the advanced companies use these methods, thus, making it an essential tool to use. Organizations must first figure out how they want to stand out, and then leverage all of the parts of information systems to achieve that goal.

Iveco can be considered in the right way of developing projects and having more experience with every project. However, there is still room to expand the use of the today's technology and programs.

6. Additional Facts About Configit

As for the program developing, there are four proven methodologies that can be cited: Systems Development Life Cycle (SDLC), Rapid Application Development (RAD), Agile and Lean. In Figure 23, characteristics of these methods are provided.

Characteristic	Methodology			
	SDLC	RAD	Agile	Lean
Overall Flow	Structured	Structured	Incremental	Minimalist
Analysis	Methodical	Methodical	Iterative	Iterative
Design	Methodical	Interactive	Iterative	Iterative
Development	Sequential	Interactive	Iterative	Iterative
Testing	Follows Development	Combined with Development	Combined with Development	Combined with Development

Figure 23: Programming Methodologies

In SDLC, preliminary analysis, system analysis, system design, programming, testing, implementation and maintenance steps are followed in exact order. Instead, RAD is a method which focuses on quickly building a model of the software getting feedback from users, and then using that feedback to update the working model. After few steps of this cycle, the final version is released. The RAD phases are: requirements planning, user design, construction and cutover. Configit can be considered to be developed with a method in between RAD and Agile. It is not possible to imply that is fully developed with an Agile technique for several reasons like “not completely following the scrum method”, as discussed before. Moreover, it can also be considered as a RAD since the Configit is a ready software which has to be customized with the feedbacks coming from the company.

The switching from the old configurator to the new one is also a concept that needs attention. In the business slang, it is called the cutover. Timing of the cutover phase is crucial and is usually done when there is low activity. For instance, IT systems in higher education undergo many changes and upgrades during the summer or between fall semester and spring semester. In mid 2022, Iveco will replace the old configurator IPC with Configit. Indeed, they aim to cut IPC when the spin-off is complete, when the company is a bit more stress-free. It can be tough to encourage a group of individuals to learn and adopt a new system. Employees being asked to adopt new software and execute a new business procedure might have far-reaching consequences throughout the company.

When it comes to implementing a new system, a business can use a variety of techniques. Most used four techniques are as following:

- *Direct cutover*, the company selects a date to expire the old software and implement the new one. Is a fast and cheap technique, but risky.
- *Pilot implementation*, a group of people begin using the new software.
- *Parallel operation*, both the old and new software is used at the same time. It is an expensive method since support is required for both systems.
- *Phased implementation* is a method where the new system is gradually introduced. Some of the functions in the old systems go in phase-out while in the new system they are encouraged.

The case for Iveco is the **parallel operation**. Both IPC and Configit were used approximately for 9 months. Even if this is considered as the most expensive method, Iveco already had a fully functional configurator (IPC) which did not need any support. So, all the support was focused on Configit while the company was trying to encourage the workers to work on Configit. This way, the additional costs related to IPC were mostly avoided.

7. Conclusions

The project management techniques are very powerful methods when used effectively throughout the company. The SWOT analysis is more or less used for every project for most of the companies. It helps CEOs, CFOs, project managers and even stakeholders to understand the risks and possible incomes of a future project. The Kanban has become essential especially for IT companies. Kanban boards are now created even for the daily activities and it may be the best solution to track activities. Scrum is a very organized way to split the activities and controlling them. But it requires much care and attention. Most of the big companies like Google, Facebook, Apple, Spotify, etc. use this method so can be considered proven.

As for Iveco, it is a solid company which is really tied to its traditions and Italian ancestors for doing things, which is the most secure way. They take things slow when it comes to evolution and actually this is not a bad strategy because the risks are lower. For instance, they did not want to adopt their systems to SAP. Instead, they asked SAP to customize their systems to adopt Iveco's system. From this fact, it is understandable that they play their cards safe. In addition, they also are considered as followers when it comes to innovation.

Iveco really tries to change with time, using the project management methodologies. They try to adopt these methods slowly by adopting in their way, by customizing them. With this analysis, a medium-size and a medium-priority project, Configit, was analyzed in terms of how the project management techniques. It is observed that they are actually very much used in this project and given evidence that Iveco is a promising company trying to adopt the 21st century evolution.

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