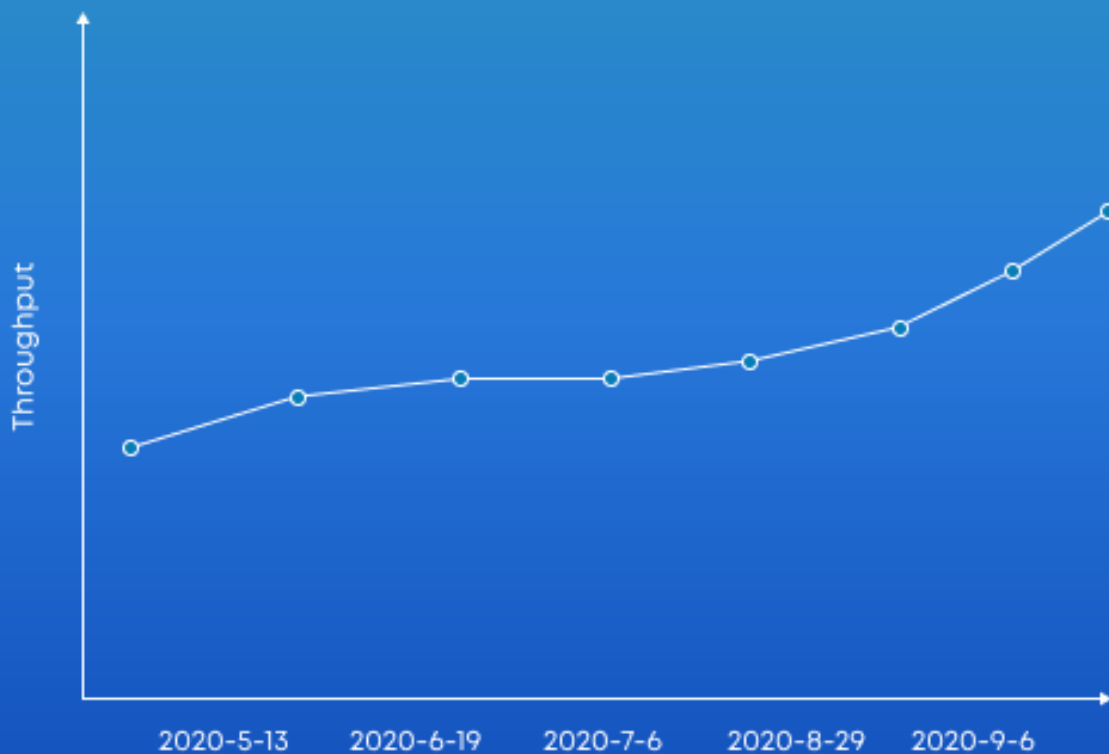


How a Global Industrial Technology Company Doubled Its Team Throughput In 12 Months?

CASE STUDY | Sensata Technologies Bulgaria



How a Global Industrial Technology Company Doubled Its Team Throughput In 12 Months?

Industry

Industrial technology

Size

200+

Location

Distributed (Offices in US, Japan, Bulgaria, etc.)

Specializing in

Sensor-rich solutions



We believe that the implementation of Kanban systems across all the teams and at the value stream level would scale the results and increase the overall throughput..."

Introduction

Management of multiple projects or services that compete for resources is a constant challenge for an organization. Although the organization maximizes the employees' workload, the leaders are often confronted with a lack of predictability, focus switching, delays in critical deliverables, and a high level of stress. In addition, project managers need to invest significant efforts to determine and maintain objective indicators of the initiative/project progress against the plans. Working remotely makes these aspects even more challenging. Many teams initiate more and more meetings to compensate for the lack of visibility and to socialize and organize their work.

The Software Development team in the Mechanization department of Sensata Bulgaria rose up to these challenges and initiated a program to improve its workflow in order to provide the best possible value to the organization and its clients. At the beginning of 2020, the team was under tremendous stress to fulfill a high number of requests generated by multiple projects and internal customers with limited resources. The workflow was uneven and in practice, "managed by escalations". Dimitar Panayotov, the team supervisor, with the support of Georgi Kirilov, Mechanization Team Manager, started an initiative to improve the software development workflow by means of using the Kanban method.

The initiative's objective was to achieve a predictable schedule for the fast delivery of business value and gradually increase the throughput. To achieve this objective, under the guidance of Ivaylo Gueorguiev, Kanban coach and trainer, the team established and started to use a Kanban system.

A year after the team started this initiative, the team's throughput, measured by a 3-month moving average of the number of requests completed in a month, **increased from 17 (average number of completed requests March-May 2020) to 43 (average number of completed requests March-May 2021).**

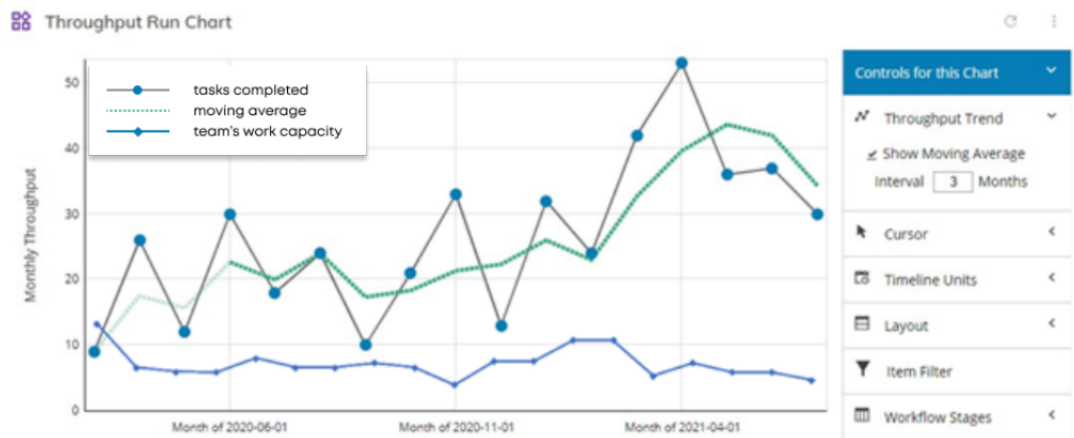
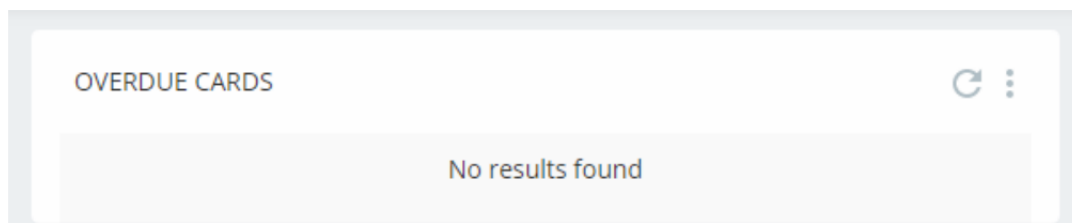


Figure 1. Run chart of aggregated throughput, including a number of completed development and support requests.

In addition, the team significantly improved the predictability of its work. While in March 2020 almost all tasks were delayed, in May 2021 the dashboard of the company's work management platform indicated only a few or even none ("No results found" referred to the illustration below) for the number of OVERDUE CARDS.



While the initiative was an undisputed success at the team level, it was harder to assess how it contributed to the overall value creation at the organizational level. Using the Kanban board statistics and analytics yielded a list of observations of system limitations at the organizational level. Most notably:

- High priority requests were being executed in A.S.A.P. matter (typically up to 2 weeks). Around ~6.3% of high-priority tasks were then waiting for validation for another 1-2 weeks. This might indicate insufficient synchronization between the different teams and projects. It also points to an inability to distinguish important from urgent work.
- A large number (~9.5%) of tasks ended up with a higher priority than the priority they initially started with. The main reason for this was a sudden change in the task's importance, usually by escalation. This might indicate a lack of clear, well-defined, common goals between cross-functioning teams.

We believe that extending the Kanban system with a proper work management solution to the overall value stream level, including upstream, will significantly increase productivity and result in more predictable operations.

What did we do at team level?

The overall objective was to establish and maintain an adaptive and predictable workflow to maximize value for the client.

Let us explain Kanban. David Anderson determines six general practices (G.P.)

- G.P. 1 Visualize Work
- G.P. 2 Limit Work in Progress (W.I.P.)
- G.P. 3 Manage Flow
- G.P. 4 Make Policies Explicit
- G.P. 5 Create/introduce Feedback Loops
- G.P. 6 Improve Collaboratively Evolve Experimentally

For simplicity we will describe our Kanban system in the order we follow; we will also refer to the General Kanban practices, but not structure the content around those practices.

Mike Burrows, in his book *"Right to Left: The digital leader's guide to Lean and Agile"*, distinguishes three elements of the Kanban System as presented below:

1. Visual representation of the workflow (G.P. 1 Visualize)

In manufacturing, the workflow is visible on the production line. Dashboards provide information about the status of the workflow. In contrast, knowledge workflow is not readily observable. It is in our brains and I.T. systems. To understand, manage and optimize the knowledge workflow, we first need to visualize and measure it.

We used a Kanban board to visualize the process steps and real-time workflows by/for different work types, as well as the organization's essential policies for managing the workflow. The board facilitated effective communication within the team and with relevant stakeholders.

Initially, we created a large physical Kanban board – four whiteboards joined vertically on the workshop wall. Soon after, COVID19 hit. Every employee whose physical presence at the workshop or production facilities was not critical had to switch to working from home. We, therefore, had to replace the physical Kanban system with a digital one literally over one weekend. We chose to visualize and organize our workflows using Businessmap. We chose their software solution because of the rich Kanban features, excellent user interface, and comprehensive analytics.

The board visualized the knowledge workflows as horizontal lanes with different columns (process steps) through which the work evolves, and knowledge is discovered. For example, the steps for Support workflow include:



Figure 2. Flow diagram of the Support activities

The process steps in orange color form the Lead Time for this workflow. "Debug done" colored in light orange is a queue where the work is stored to wait until capacity is available to validate it.

Horizontally the support workflow is separated into two lanes, one for incidents and one for standard support work. These are different classes of services that represent different risks. Therefore, we want to visualize and manage them differently. The development type of work uses enhanced workflow such as:



Figure 3. Flow diagram of the Development activities

As indicated in the Support activities workflow, the steps in light orange color Design/Dev/Done and Validation/Wait represent queues. The visualization, monitoring, and control of queues are essential for us to be able to optimize the overall lead time.

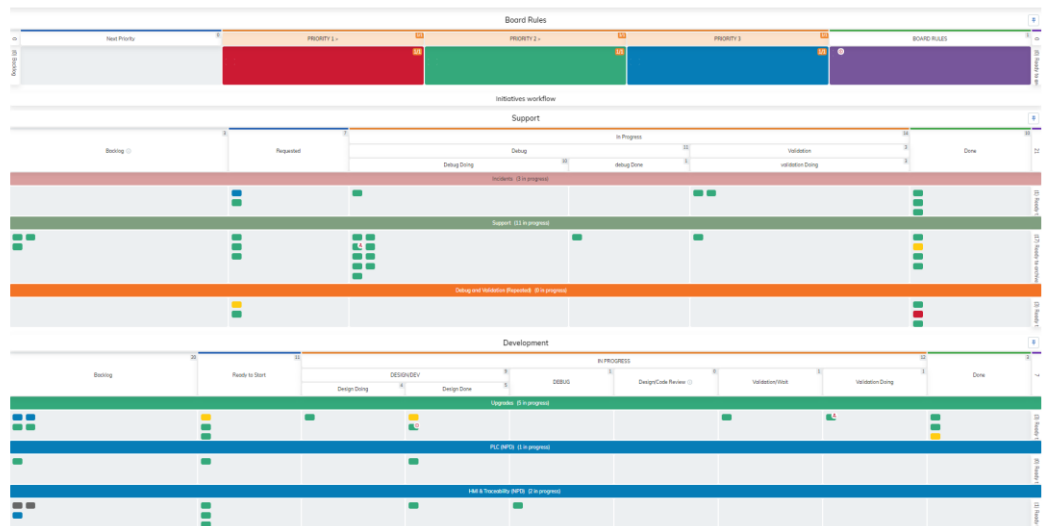


Figure 4. The Board in the Businessmap Software Platform represents Board rules and policies, Support Workflow, and Development Workflow. For confidentiality, the details of the requests are not displayed.

The team changes (improves) the policies and workflow structure as needed. Currently, the Development workflow consists of five different work types in separate lanes, all related to new development (NPD): Upgrades, PLC/NPD, HMI & Traceability, Robots and simulations, Vision Systems, Improvements, and Reporting. The lanes support the visibility of work types and capacity allocated to each work type. Capacity per lane is dynamically managed based on the given priorities and demands.

2. Visual representations of individual work items and related policies (General Practice (G.P.) 1 Visualization and G.P. 4 Make Policies Explicit)

In manufacturing, we see the work in queues (storage points) and the work process at each machine. Once we detect imbalances in the storage points and work in the process, we can make decisions that help balance the workflow.

The knowledge work is not readily visible. In the best case, it is represented by tasks in the project plans. It is almost impossible to adhere to the plans defined by the managers while ad-hoc support tasks arrive at an unpredictable rate. In our Kanban system, virtual cards represent work items on the workflow. Each work item represents a request that, when completed, will add value for the client. The request itself is usually broken down into tasks. The team members maintain and discuss the request status and position daily. This process facilitates discussions and makes decisions in real-time.

Moreover, we can define different classes of services and align our work priorities with them. Work priority is determined by the cost of delay in each class of service. The management determines the impact in consultation with project managers and supervisors. Usually, the priority is associated with specific initiatives or product lines. Once the priority is set, it is visualized on the board, and the team replenishes (i.e. plan execution of) the work items based on the set priorities and board policies. (See Figure 5 - The Board rules lane representing a summary of the priorities and Kanban Policies).

The individual work items could be:

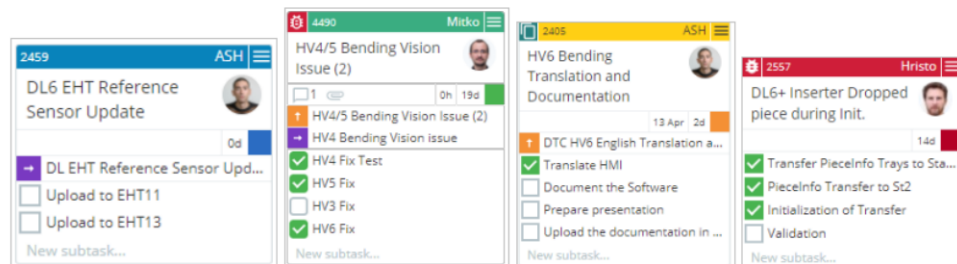
- **"Intangible"** class of service work items are with low priority. We can delay their execution with little or no cost of delay. We color the respective cards in blue. The usual policy for planning and processing those items is "When we have capacity."
- **"Standard"** class of service work items is with normal priority. The cost of delay is increasing with time. The more we delay the completion of those items - the higher the cost they generate in the system. The corresponding cards are colored in green. The usual policy for planning and processing those items is "First In - First Serve".

- **"Fixed Day"** class of service work items priority depends on the time. The cost of delaying those items increases rapidly on a specific date, usually referred to as a deadline. A deadline for the work item is set and filled out on cards colored in yellow. The team considers the work item's complexity and lead time distribution for similar work items to decide to start working on it. Depending on the time frame, the fixed day class of service work items has equal or higher priority than the standard class of service.

- **"Expedite"** class of service work items has high priority. They generate a high cost of delay in a short time. These items are critical project work, escalations, or line stoppages. Expedite tasks should be completed as soon as possible. If needed, the task can override any system policy or W.I.P. limit and could be executed on nonworking days.

In most cases, high-level managers categorize a task as Expedite and authorize the individual actions such as overtime, nonworking days presence, etc. Other work items assigned to the respective developers are transferred to another developer (if possible) or blocked with a Blocker "Reprioritization" until a developer can take them. Those tasks are visualized as red on the board and are visible in the overview dashboard.

The card on the board represents the work, and the critical information about the work (type, subtasks, comments, description, responsibilities, attachments, etc.) is logged directly on the card. The team is organized around the work, and the information is updated as needed. Relevant stakeholders can see the progress and align their plans.



At a higher level, the agreed priorities set by senior management are visualized in the policy lane. Usually, they represent priorities at project level rather than at feature level, providing information about the priority of various projects.

The managers and the team determine the classes of services on the work item (card) level. The limit of one priority per cell creates clear priority order and does not allow several high-level priorities.

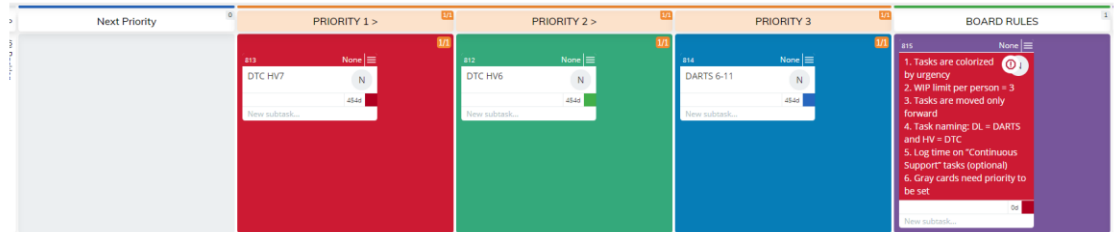


Figure 5. The Board rules lane representing a summary of the priorities and Kanban Policies

The visual representation of the global priorities helps to focus the resources of the team and all relevant stakeholders on the most valuable work to be done in the respective period.

3. Policies to control the number of cards in the system - work in progress (W.I.P.) limit (G.P. 2 Limit WiP)

The team determined the work-in-progress limit (W.I.P. limit) policy to create flow and eliminate focus shifting, a by-product of multi-tasking that reduces efficiency because the team member needs to refocus on a different task. We decided to use a simple policy of a maximum of 3 work items (cards) per team member. At the beginning, limiting the number of tasks each team member was working on was a challenge. However, in time managers and team members experienced the benefit of this policy. Currently team members maintain a W.I.P. limit of 2 items per person most of the time. The W.I.P. limit of 3 is reached when an expedited class of service work items is assigned to the person. We decided to use W.I.P. limit per person instead of other kinds of W.I.P. limits (per column, lane phase, etc.) because when one person commits to a request, they usually work on it during all phases until they complete it.

Measure and improve performance (G.P. 3 Manage Flow)

Setting up the Kanban system was not an objective in itself. With this initiative, we aimed to increase performance, improve predictability, reduce mistakes and boost teamwork.

Over one year since we introduced this new way of working, the team's capacity changed significantly. In March 2020 – June 2020, capacity represented by equivalent full-time employees decreased **by about 25%**: team members initially worked reduced hours due to the COVID19 pandemic; then a few of them left the team. Near the end of the one-year period, in March 2021 new members joined the team, however they needed time to get up to speed with the work and did not perform at 100% capacity.

The system's average throughput, measured as the number of completed work items per month, constantly increased during the same period. In addition, we ensured that the value of the work items (requests) completed was better aligned with the priorities of the organization.

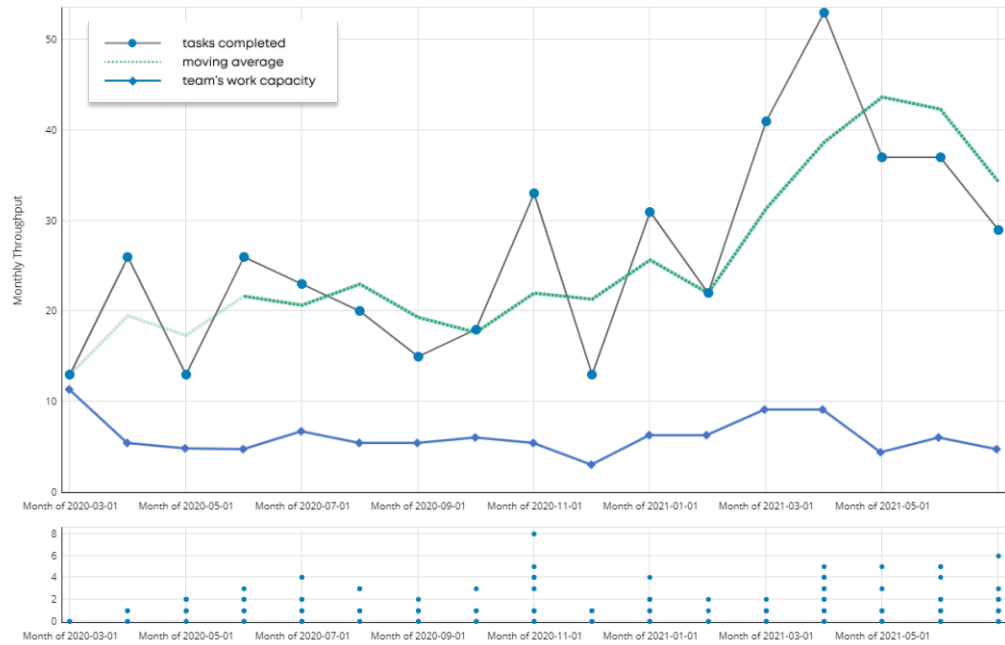


Figure 6. Total Throughput Support and Development

The pull system, which the Kanban way of work established and maintained, allowed the team to balance support and development work and adapt to the variations in demand.

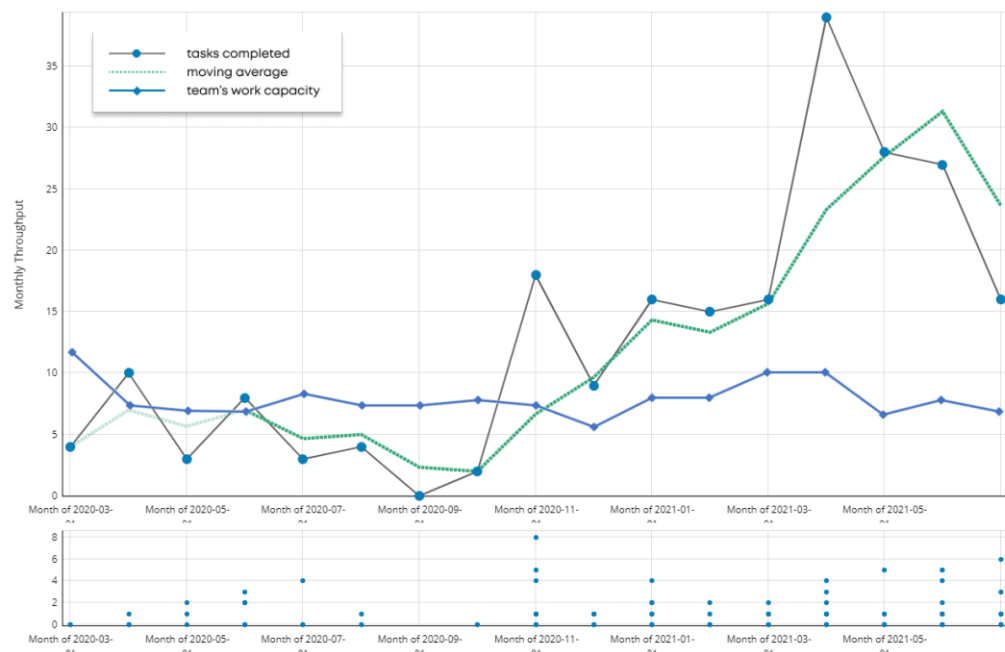


Figure 7. Throughput Support

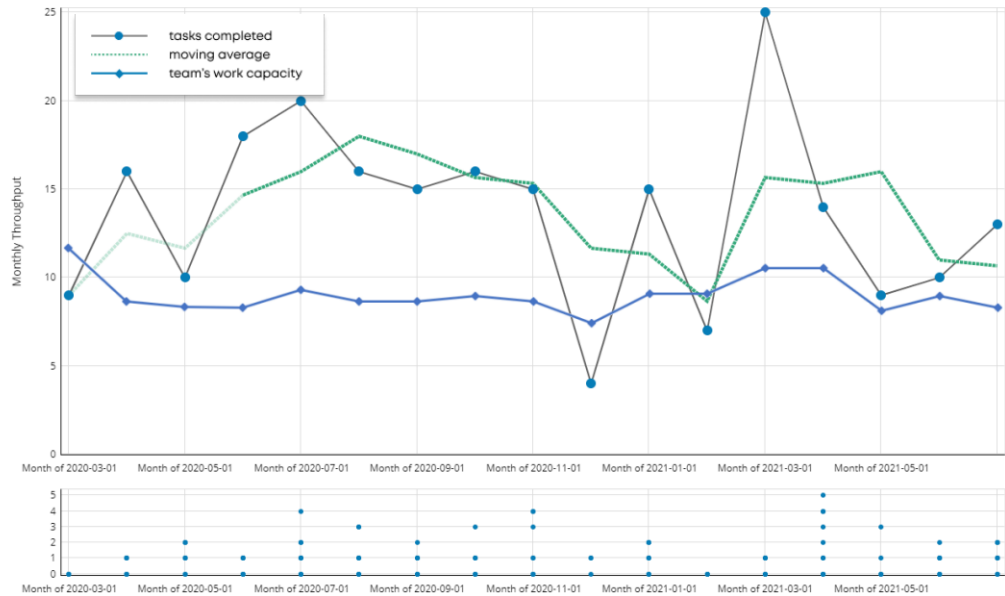


Figure 8. Throughput Development

Our workflow contains the development and support cycles since we design and assemble production lines (development) and then install and maintain them (support). The board and the respective analytics in the software platform provided excellent tools to manage and balance the workflow.

We achieved a certain level of predictability for the urgent and fixed date requests (class of services), the predictability of the standard requests was still a challenge. We plan to focus on it in the following months.

Balancing the load

Balancing the software team's load is split into two: W.I.P. limits and cadences (meetings).

a. W.I.P. Limits (G.P. 2 Limit W.I.P.)

In the beginning, the team agreed to set a maximum limit of 3 work items per person at a time. This policy means that before starting a new work task, another one must be completed. The expectations were met – lower W.I.P. increased team focus, lowered tasks cycle time, reduced pressure and fatigue, and increased happiness. That also ensured that the work items we started would be finished in a reasonable time.

Naturally, the team appreciated that work was being processed faster after the introduction of the W.I.P. limit. Currently, most of the team members work on no more than 2 items at a time.

b. Meetings (G.P. 5 Feedback loops)

The Businessmap Software Platform provided excellent visibility on the workflow and comprehensive data for decision-making which we are using daily in our meetings. We established and maintained feedback loops as follows:

Daily:

Initially, to better control the flow of work, the team agreed to meet every day for 30 minutes. We decided to meet in the afternoon, which in our case was more efficient to ensure prioritization and transportation flexibility. Initially, daily meetings took longer than planned, often up to an hour. Over the following months the team managed to reduce the average length of the meeting to less than 30 minutes. The Division manager and project managers who attend the daily meetings appreciated this too, as they could use the newly available time to communicate priorities and align the tasks of the engineering and assembly personnel with those of the software development team.

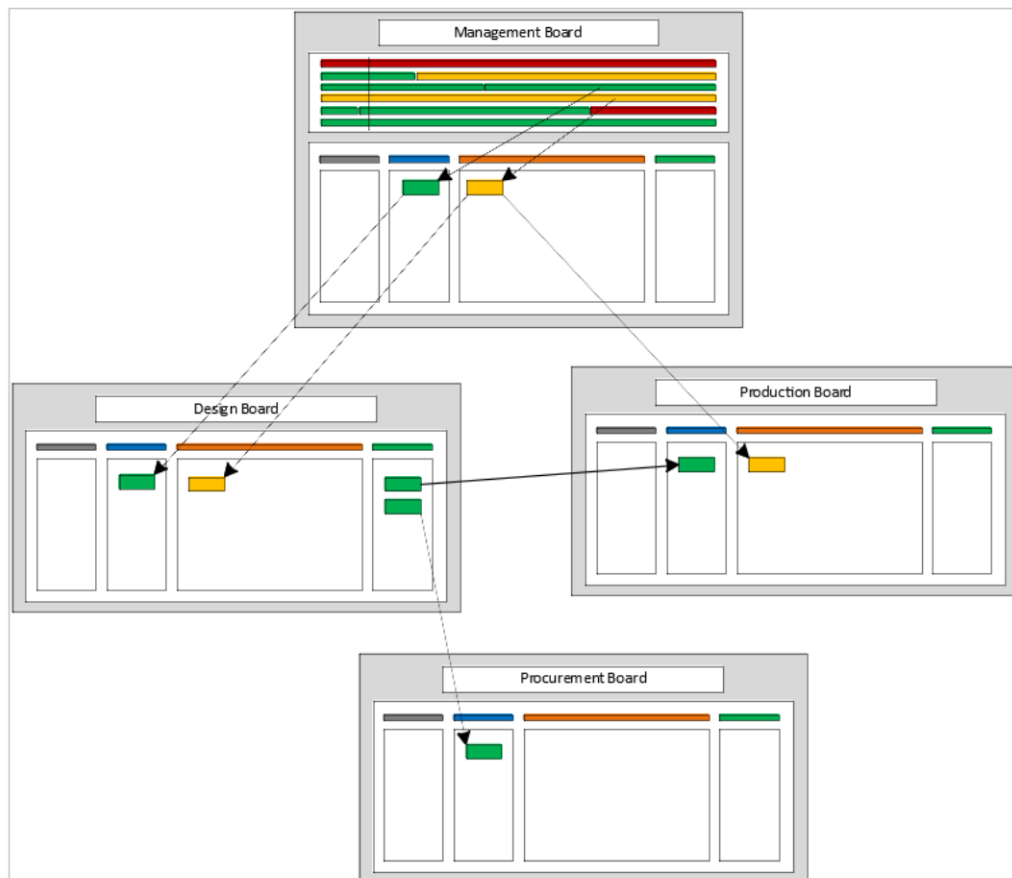
Retrospective (2-4 weeks):

In the continuous improvement process of Kanban, before making a change, an expectation for the outcomes of this change is defined. The team uses retrospective meetings to reflect on the expectations and to define what can be improved. One of the ideas has been to perform systematic code reviews that are expected to decrease the number of defects and increase code reusability (G.P. 5 Feedback Loops).

Replenishment:

Currently, task replenishment is done by senior management; alignment with the team is not defined within a separate meeting and is dependent on most-pressing risks and priorities. Therefore, the replenishment has been integrated within the daily meetings.

What can we do on an organizational level?



Visualize the work for the key activities/teams

The teams visualize the work while paying particular attention to interdependencies and work items in the critical path of the projects. Key flow measures such as lead time, throughput, flow efficiency, and W.I.P. on the team level are established and used. Representatives of the team regularly and on ad hoc basis discuss interdependencies and decide how to eliminate, minimize or manage them. Teams review blockers, aging work items, overdue work items and address the respective causes.

P.M.s visualize the work on project/portfolio level

Project managers visualize the projects and work packages containers of the work items provided to the team. Key flow measures such as lead time, throughput, flow efficiency, and WIP on the project level are established and used. Work in process on project and work package level is controlled to balance the demand and capability of the system. Priorities are agreed upon among the projects and teams. PM and teams regularly review the value stream and agree upon improvements.

In conclusion

We believe that the implementation of Kanban systems across all the teams and at the value stream level would scale the results and increase the overall throughput of the organization in terms of the number of machines/ lines produced per month or quarter. Each team/organizational unit is considered a service provider, and the organization is viewed as a network of services. The overall concept is known as the Kanban lens (see <https://d-jaa.com/the-kanban-lens>). To put in practice, we will keep using the software solution by Businessmap due to its flexibility for extending workflows on an organizational level.

About Businessmap



Businessmap is an Enterprise Agility solution provider aiming to discover new management ways and share this knowledge through amazingly powerful, easy-to-use tools and professional services.

Businessmap offers the most flexible software platform for outcome-driven enterprise agility. Its unmatched functionality consolidates multiple tools into one, enabling affordable deployment at scale, visibility across all projects/portfolios and alignment on goals, to deliver quality work faster. Pairing it with the proprietary consulting program delivers a tailored solution that ensures lasting value and exceptional ROI.

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