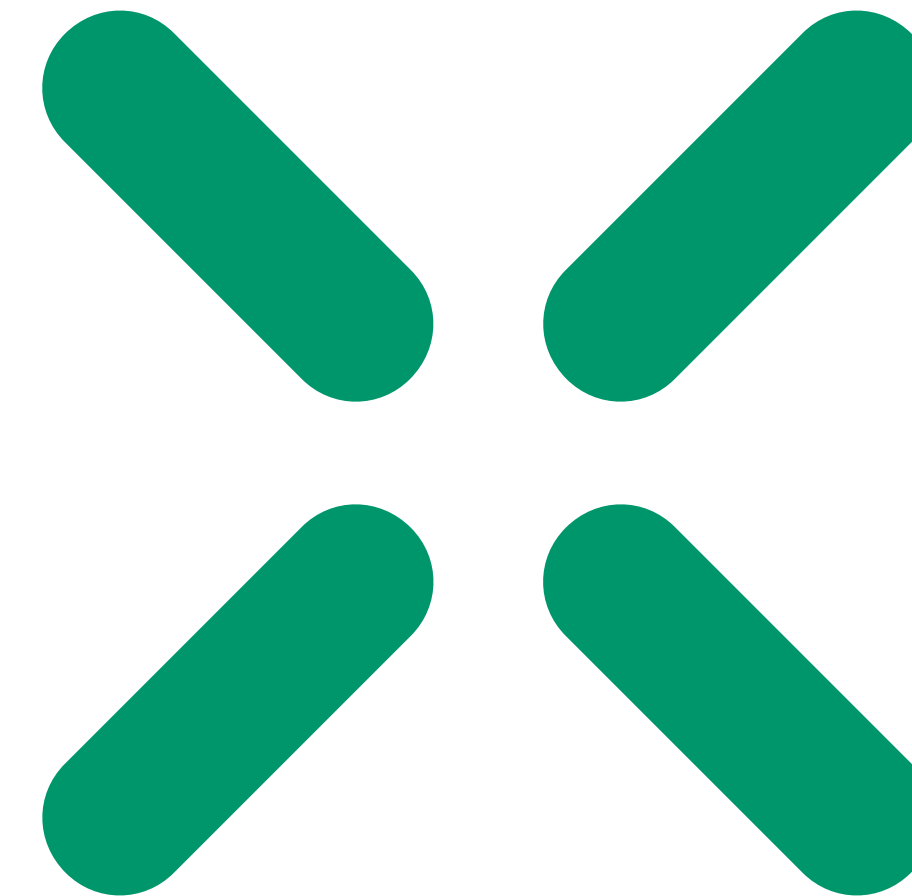


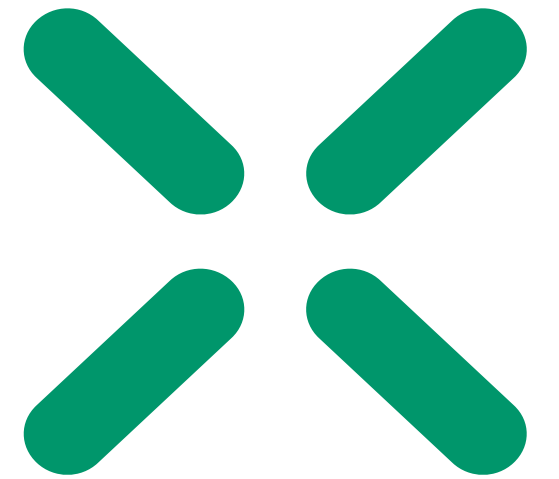
System of Impact

The SIX Story from Joint Vision
to World-Class Execution

Foreword

Sustainable Industry X (SIX) is a bottom-up initiative emerging from industry and industry-adjacent research and development, aimed at the digital and green renewal of Finnish industry. 'System of Impact: The SIX Story from Joint Vision to World-Class Execution' describes the origins of SIX, its journey to date, and an outlook on the future. It tells how an initiative that has often shown the way was formed and how its activities have taken concrete shape. This is not an exhaustive history. Rather, it is a distillation of what matters most: why SIX exists and why it continues to grow. By sharing this story, we also contribute our own observations and lessons learned along the way.





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It had been the same for a long time. Good plans, but fragmented execution. We parachuted in and started playing a slightly different tune.

First, we aligned on a shared direction through agendas; then we developed tool-based content to support implementation. Simple things but approached from a less traditional angle. At the practical level, we also framed and highlighted one of Finland’s strong export sectors: mobile work machines. The five-year journey has been interesting.

At times we succeeded, at times we stumbled—but we always got back up. That is part of the Finnish DNA, and something worth bringing to the surface in times like these.

Preface



“Innovation is a contact sport.” It is based on close interaction between different actors. Innovation requires an active and committed group of people who push ideas forward with determination. It also requires a social mandate—visible or hidden. If the need is not yet obvious, market demand must be created. Success often depends on timing and, at times, a bit of luck. The path is rarely straight; it is almost always a journey of experimentation, mistakes, and learning.

All these elements have been present in the birth and growth of Sustainable Industry X. The initiative can be seen as an innovation in its own right, supporting the digital and green transformation of Finnish industry. It has established its position in the Finnish ecosystem and acted as a trailblazer in many respects—even if not all economic potential has yet been fully realized.

Today, SIX is a well-known name in Finland, and many people have some connection to a part of the initiative. What happens under the SIX umbrella, however, is less well understood, and the big picture often remains unclear. One aim of this story is to highlight the diversity of the initiative. Its primary goal, however, is to describe the activities and communicate the impact that SIX has achieved—and continues to pursue.

The title ‘System of Impact: The SIX Story from Joint Vision to World-Class Execution’ reflects the essential core of SIX. Practical collaboration and a systemic approach are central to everything done under the initiative. The story has two parts: 1. The story of SIX, and 2. Lessons and insights.

Because the birth and growth of the initiative did not follow the traditional Finnish research, innovation, or business ecosystem model, the first five years of SIX have been a significant learning journey. Experimentation, trial and error, and continuous development have played a central role. In the second part of this book, we highlight selected lessons learned along the way.

Before turning to the substance, we want to thank everyone who has been part of the SIX initiative—from industry, research, and public-sector organizations. Your contribution has been important and valuable. System of Impact is a shared achievement, and the journey toward the future continues.

This document is an English translation of original Finnish version having title 'Tekojen systeemi'.

Tampere, 25 March 2026

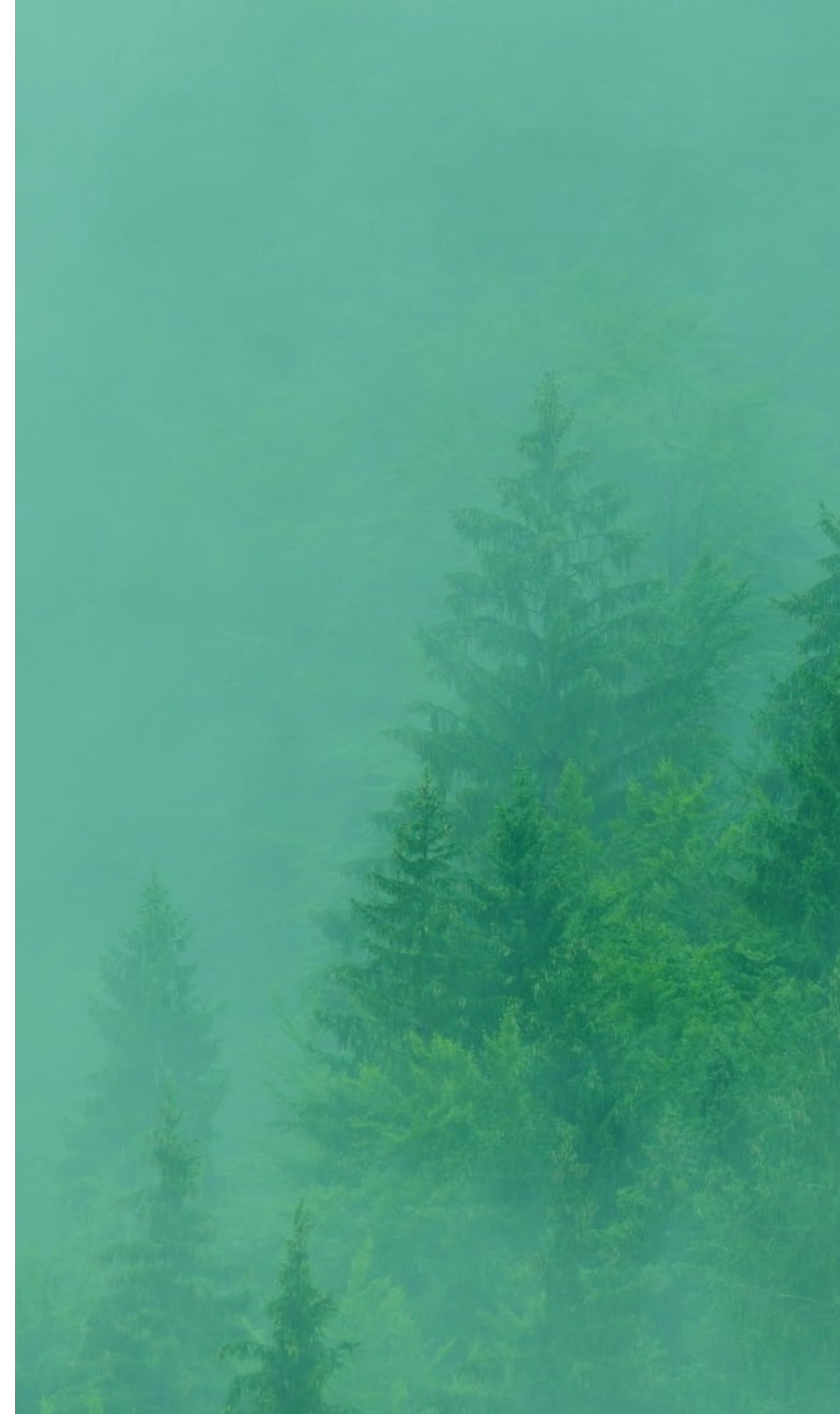
Jaakko Paasi, VTT
Harri Nieminen, VTT

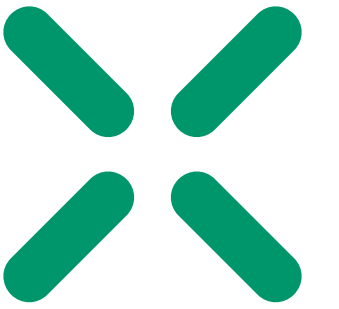
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Part 1

The Story of SIX





The birth of SIX

The origins of SIX date back to 2019–2020. The initiative emerged from two independent, needs-based starting points.

The first, which framed the overall direction, came from industry-oriented research. Tampere University and VTT sought to renew their joint Smart Machines and Manufacturing Competence Centre (SMACC) to better support industrial renewal.

The second starting point, which shaped the practical implementation, came from industry. At Sandvik Mining and Construction, a clear need was identified to accelerate the digital and green transition of the mobile work machines sector by renewing collaboration between companies and research.

SIX was born when these two needs met and began to grow into practical joint action.



“SMACC 2.0” – Research Starting Points

SMACC was an ecosystem jointly established and led by Tampere University and VTT, targeted particularly at SMEs in manufacturing. Its goal was to support companies in the digital transformation of manufacturing and to identify new operating models to help actors capitalize on digitalization.

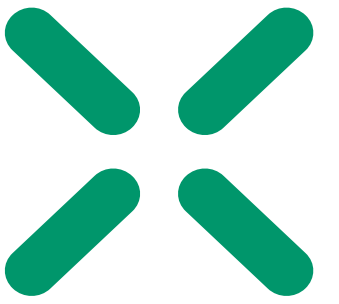
Although SMACC operated for several years and produced valuable work and projects, it did not meet expectations or scale as hoped. As Pauli Kuosmanen, Director of Research and Innovation Services at Tampere University, puts it: “We saw that SMACC was not growing and scaling as desired. Together with VTT, we decided to aim for something bigger.”

One of SMACC’s core challenges was leadership. After the initial funding that sparked the ecosystem ended, no one was taking it forward full-time.

“We decided together with Tampere University to recruit a suitable person from industry to renew SMACC. Harri Nieminen from Fastems was selected for the task,” recalls Erja Turunen, EVP at VTT, of the events in 2019–2020.

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The name Sustainable Industry X (SIX) describes the desired future of Finnish industry.



“When Harri started, he stated that the name SMACC had to be changed to something without historical baggage,” says Turunen.

“At one point, we talked about Industry 6.0, because we wanted Finnish industry to become known for a level of development beyond Industry 4.0,” Kuosmanen continues.

As a result, the new name chosen was Sustainable Industry X, more widely known by the abbreviation SIX, which also signals a forward-looking ambition. The name describes the desired future of Finnish industry. The concept of sustainability covers all its dimensions: environmental, economic, and social sustainability. The letter X has two meanings.

On the one hand, it symbolizes the next stage of industrial development—one that does not stop at the fourth level but deliberately aims higher. On the other hand, the letter X reflects the disruption faced by traditional industrial sectors as a result of digitalization, sustainable development, and ecosystem-based ways of operating.

The SIX initiative emerged at a challenging point in time, but this quickly turned into an opportunity to build something new. The year 2020 was overshadowed by the COVID-19 pandemic, which led to an industrial downturn. In the summer of 2020, VTT received an operational and financial mandate from the Finnish Government aimed at safeguarding production-related jobs in manufacturing and strengthening companies’ competitiveness in the post-pandemic operating environment.





Part of the resources was allocated to building the foundation of SIX: engaging in broad-based dialogue with industry and other stakeholders, formulating a shared vision for renewal and a common agenda, and compiling the initial set of implementation tools. At that stage, everything was still in the cloud. The difficult circumstances, however, made it possible to create a more solid foundation than would have been feasible under normal conditions.

The vision work related to industry–research collaboration in the early phase was carried out on a large canvas. “In our wildest visions, SIX encompassed the entire Finnish manufacturing industry. The key question was where to focus. On Vilenius’s desk, Sandvik’s vision for the mobile work machines cluster appeared particularly well suited to support this work,” Turunen explains. Pauli Kuosmanen confirms Turunen’s recollection: “There was extensive reflection on where SIX should be anchored: manufacturing industry or something else. Vilenius’s thinking had a strong influence on the decision to select mobile work machines as the first focus area.”

Gradually, the initially scattered pieces began to fall into place smoothly. The development of a toolbox to support the implementation of new shared agendas crystallized into a collaborative operating model for industrial renewal. The foundations had been laid.

Bringing Forces Together - Industrial Starting Points



Numerous companies operating in Finland that manufacture mobile work machines have long been central players in the country's export industry. Despite this, few recognized the overall picture and the true significance of this sector for national well-being.

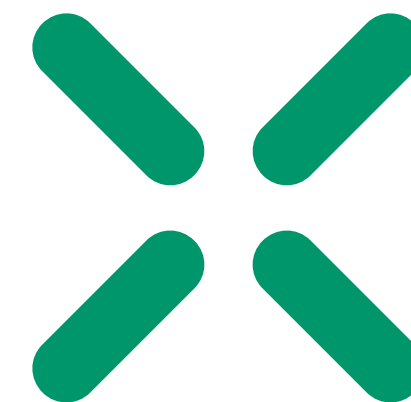
"Even in the early 2010s, we were not recognized as an industry in our own right. However, we had a strong ambition to bring the sector together, dismantle barriers that hinder collaboration, and enable industry and universities to work jointly toward shared objectives," says Sandvik's Director Technology Development and Services Jani Vilenius.

It was clear that, given Finland's scale, even the largest company could not achieve this alone. What was needed was a new kind of collaboration between different actors—one that explicitly took the development of the operating environment into account.

"We wanted to create a competitive operating environment built on world-class expertise and cutting-edge research," Vilenius continues.

The journey did not start from a blank slate. Sandvik and many other machine manufacturers had already been involved in various joint development initiatives in the past, both in Finland and internationally. Two directly relevant examples stand out: FIMA (Forum for Intelligent Machines) and RAAS (Research Alliance for Autonomous Systems).

FIMA is an industry association that promotes the development of intelligence and automation in heavy mobile machinery. Established in 2006, the association has operated successfully and, from 2026 onward, will be even stronger, having merged with the SIX Mobile Machines cluster.



RAAS (Research Alliance for Autonomous Systems) was, as its name suggests, a research alliance focused on autonomous systems. Its activities gradually declined after external funding came to an end.

As discussions on developing the operating environment and related collaboration progressed, Sandvik hoped for a more strategic approach to action, broader scope, and greater impact than what could be achieved within the existing ecosystem field. A similar challenge was recognized elsewhere in the industry, leading to a shared decision to act together. A home for future collaboration now needed to be found. Jani Vilenius reached out to teams at Tampere University and VTT—and the SIX journey began.

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**We wanted to create
a competitive operating
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National Team Jersey On – A Societal Mandate

Although the organizations that contributed to the emergence of the SIX initiative had their own, practice-driven starting points, a clear societal mandate was already recognized at an early stage. Unlike many other European countries, Finland lacked a national industrial agenda that would increase predictability in the operating environment and guide the digital and green transition.

In Germany, the 2008 financial crisis acted as a catalyst for rethinking industrial competitiveness and renewal. Ultimately, a new industrial agenda emerged from joint efforts between the German state and industry to modernize national industry for the era of digitalization. Political actors, research organizations, industry associations, and companies all participated in building the agenda. It was named Industry 4.0 and officially launched in 2011.

Many countries quickly followed Germany's example and created their own national industrial agendas or programs, more or less aligned with the German model. The scope and level of ambition of these agendas varied, but Finland was missing from the map (Figure 1).



Figure 1. National industrial programs in European countries in 2017. The map illustrates the societal mandate that existed at the time for an initiative to renew Finnish industry — Finland appears as an empty area.

Although the absence of a shared national industrial agenda that would strengthen predictability in the operating environment was significant, it alone did not create the societal mandate required for the SIX initiative. However, there was widespread discussion about the broad-based and mandate-driven whole behind SIX. The societal mandate was more strongly linked to the large body of existing good work and the need to utilize it more effectively.

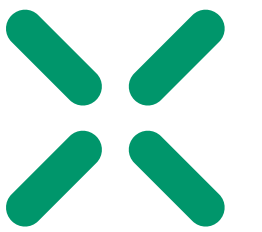
In Finland, there was an abundance of strategies, programs, and initiatives promoting the digital and green transition of industry, but they were fragmented and siloed by nature. This created a clear need to bring together existing strengths, and the new SIX initiative set out in part to respond to this need. The objective was not to create new content or narratives, but simply to consolidate and highlight what already existed—around a shared, unifying agenda and practice-oriented roadmaps.

At the same time, Finland has not, in this millennium, been particularly strong in implementing such thematic strategies and programs. Implementation has not been sufficiently monitored or guided in a broad-based, intensive, and interactive manner among authorities, industry, research, and public administration. Too often, work has taken place within narrow silos, preventing information from flowing between actors, leaving incentives unaddressed and the real impact of strategies unrealized.

This led to a clear recognition of the need to develop industry-driven tools that support implementation. It was precisely from this need that one of the key and fast-advancing insights behind the development of the SIX toolbox emerged.



The Big Picture – What Is SIX?



Sustainable Industry X (SIX) is a Finnish, industry-driven initiative that shapes and implements the next-generation green and digital industrial agenda. SIX is not a legally registered organization, a project, or a single ecosystem. Rather, it is a bottom-up initiative in which committed individuals and diverse actors advance the renewal of Finnish industry from the ground up. SIX focuses particularly on the challenge of implementation—turning strong national plans into concrete action—working from an industry-led perspective.

To achieve tangible results and impact, three fundamental elements are required:

1. Objectives
2. Actors and action
3. Tools

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What is SIX? It is not a project, nor a single ecosystem. It is, above all, a toolbox for translating national-level objectives into industry-driven implementation. The tools have been developed jointly and are freely available for anyone to use.

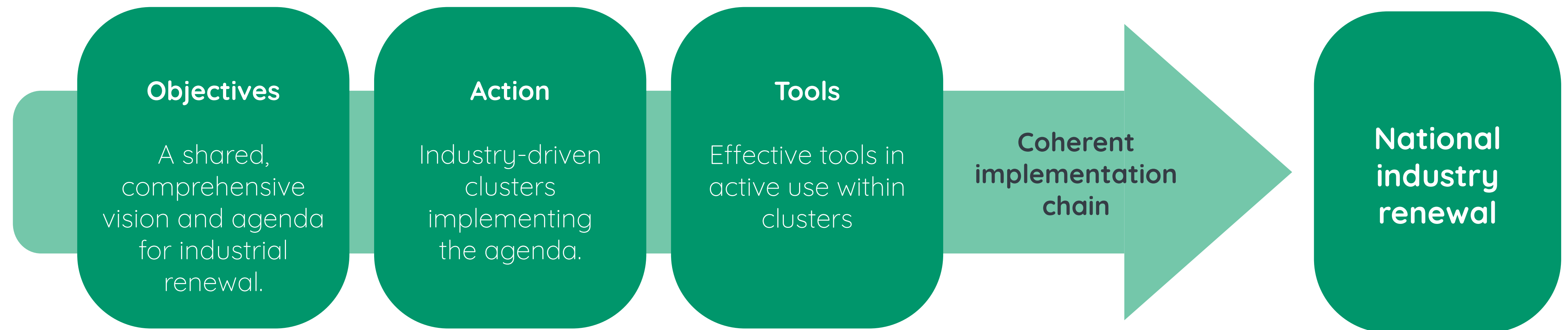


Figure 2. SIX: Levels from objectives and planning to implementation

Objectives



Without a shared overarching goal and a clearly articulated path forward, sustainable and impactful action across different actors does not emerge. For this reason, the SIX initiative set out from the very beginning to create a shared, comprehensive vision and agenda for industrial renewal—building on existing strengths. This whole brings together a future-oriented vision, separate research agendas, industrial agendas, and strategic-level objectives. The aim of the new vision and agenda was to unite actors and provide clear direction for joint action going forward.

The vision and agenda work was carefully grounded. During the formulation phase, European industrial programs and agendas were reviewed (Figure 1), national strategies and programs were analyzed, and extensive public discussions were held among stakeholders, including large companies, SMEs, research organizations, industry employers' associations, trade unions, public administration, and ecosystem operators.

The objective was to form a shared understanding of what sustainable and intelligent Finnish industry could look like in 2030. The discussions also explored Finnish industry's competitiveness factors and what would need to happen for the desired future to become reality.

The SIX Vision and Agenda work¹ was published at the end of 2022. The vision was articulated as follows: Finland is a sustainable winner in the twin transition. The vision was anchored in common objectives defined in national strategies. According to these, within approximately ten years Finland will effectively harness advanced technologies and other key digital technologies, move toward carbon neutrality, and Finnish companies will be global frontrunners in sustainable solutions in international markets.²

- In the world envisioned by the vision, the competitiveness of Finnish industry can be crystallized into two distinctive strengths:
- 1. We are globally recognized for helping our customers operate in a sustainable and responsible way (environmental footprint).**
 - 2. Through an ecosystem-based way of working, we have the capability to bring actors together to solve complex problems on rapid timelines and thereby respond to winning global and growing demand.**

¹ Paasi, J., Nieminen, H., Salminen, K., Apilo, T., Heilala, J., & Virkkunen, R. (2022). *Sustainable Industry X: Suomalaisen teollisuuden uudistumisagenda*. VTT Technical Research Centre of Finland. VTT Technology No. 410 <https://doi.org/10.32040/2242-122X.2022.T410>

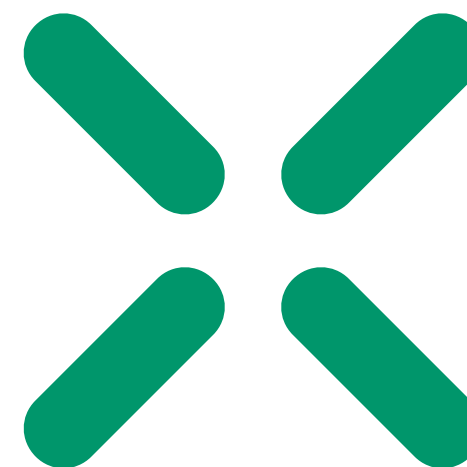
² Paasi, J., Nieminen, H., Kurki, S., Apilo, T., Martins, J. T., Malinen, S., Ahola, A., & Salminen, K. (2021). *Sustainable Industry X: Kohti suomalaista teollisuusvisiota ja -agenda 2030*. VTT Technical Research Centre of Finland. VTT Technology No. 389 <https://doi.org/10.32040/2242-122X.2021.T389>

Similarly, the vision and agenda work identified four key “battles to be won” through which the objective of a competitive, sustainable, and globally successful Finnish industry by 2030 can be achieved. Accordingly, Finnish industry must:

- 1. Lead the transition to sustainable production and business models**
- 2. Remain at the forefront of the digital transition in selected areas, both as a pioneer and as an advanced adopter**
- 3. Increase productive investments and RDI (research, development, and innovation) investments**
- 4. Ensure access to a sufficient supply of skilled workforce**

The high-level vision and agenda that were developed have provided a shared direction for the industry-driven SIX clusters and their own visions and agendas. In this respect, the work has succeeded in its objective of bringing together different actors within the initiative.

However, the broader ambition to influence the emergence of a national industrial renewal agenda has not yet been fully realized at scale. That said, the impact of the work is clearly visible in various forms across several national-level strategies and programs, such as the Ministry of Economic Affairs and Employment’s (TEM) Artificial Intelligence 4.0 program, including its final report³.



Petri Räsänen, Head of the Artificial Intelligence 4.0 program, recalls: “When I was leading the digitalization policy team at the Ministry of Economic Affairs and Employment and the Artificial Intelligence 4.0 program, I wanted to bring the work closer to industry-driven communities. I recognized that SIX had the potential to serve as a driver for the diffusion of digital and AI-related topics into industry. Looking back, it was a win-win.”

³ Työ- ja elinkeinoministeriö (2022). *Tekoäly 4.0 -ohjelma: Suomi kaksoissiirtymän suunnannäyttäjänä – Tekoäly 4.0 -ohjelman loppuraportti*. TEM 2022:60. <https://urn.fi/URN:ISBN:978-952-327-997-1>

Actors and actions

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In broad-based collaboration that cuts across activities, actors, and industries lies significant untapped potential.

We are operating in the realm of systemic challenges and opportunities. Implementing the vision and agenda therefore requires a systemic, multifaceted approach. For this reason, the operational level of the SIX initiative is built around specialized, industry-driven clusters and ecosystems. Individually and collectively, they implement the vision and agenda. In this context, the word together gains a very concrete meaning: in broad-based collaboration that breaks down boundaries between activities, actors, and industries lies significant untapped potential. This value does not arise within traditional silos, but above all at their interfaces. It is precisely this systemic approach that SIX seeks to promote—actively bringing networks together rather than having actors advance only their own issues within traditional, siloed structures and projects.

The activities of clusters at the heart of practical implementation are at the same time focused and broad-based. Focus means identifying a shared priority for the actors involved. Broad-based action, in turn, is reflected in the fact that practical work does not remain confined to traditional division of labor or to a few cluster-driven projects—the need for and importance of such activities is not diminished.

The aim is to work in an increasingly broad-based and impactful manner, keeping the interdependencies between objectives in focus. Within clusters, joint research and innovation collaboration is carried out, influencing cutting-edge research and skills development, as well as shaping a favorable operating environment. These are interconnected elements that reinforce one another. Over time, result portfolios emerge whose contents different actors can leverage for their own purposes. “From the very beginning, the objective was that clusters would jointly pursue concrete initiatives and projects that benefit everyone,” notes Sandvik’s Jani Violenius about the approach.

All the required expertise and levers of influence are not located in Finland, and at the same time there is much to contribute at the international level. Individually, Finnish actors are small on a global scale, but when organized into clusters they form a significant force.

Acting together provides a better opportunity to influence, for example, the formation of international partnerships, the content of EU strategic research calls, and industrial standardization initiatives. In many respects, clusters are not closed bubbles; their impact extends beyond the clusters themselves, both internationally and nationally. At their best, they leverage their operating environment broadly, bringing other ecosystems and actors together around the implementation of a shared agenda.

SIX clusters have been built in an industry-driven manner around focal points where a clear need has been identified. The SIX Mobile Work Machines cluster, focused on mobile machinery, was the first cluster of the initiative. This was followed by Smart Manufacturing, focused on intelligent manufacturing; Heavy On-Road Vehicles, focused on heavy road transport; and Elastomeric Systems, focused on new sustainable elastomer materials.

All SIX clusters share a common overarching agenda, shared tools, and common characteristics, while each also has its own specific focus areas. Ultimately, each SIX cluster is shaped by its actors, who define the direction and structure of the activities themselves.





Tools

An agenda and committed actors alone are not enough; effective action always also requires appropriate tools. The identification, development, and sharing of tools are seen as one of the key enablers of SIX's broader usefulness. The initiative is therefore often described as a high-level "toolbox for implementation."

The content of the SIX toolbox has been developed—and continues to be developed—in clusters, close to practical work. The tools created are freely available for use across the ecosystem. Different actors within and beyond SIX apply them as they see fit, further develop them where appropriate, and share them forward. Valuable feedback always flows both ways.

In its current form, the SIX toolbox already provides comprehensive support for industry-driven collaboration and the implementation of the agenda. It includes guidance and planning tools, such as shared roadmaps and continuums, which steer activities and ensure alignment with common objectives.

In addition, the toolbox includes tools for activating action, enabling the implementation of roadmaps in different forms, portfolio management, and encouraging companies to take initiative and collaborate with other actors. Various platforms make visible, for example, research data, RDI infrastructures, and other resources that actors can leverage for innovation and business development. The toolbox also contains numerous practices and operating models for different use cases.

Among individual tools, the most widely recognized and important is the cluster roadmap, which guides all work carried out within clusters. Cluster roadmaps are jointly developed and maintained descriptions of the desired future and the paths leading to it, built through industry–research collaboration. The starting point for developing roadmaps lies in industry needs and innovation pathways, on the basis of which research requirements are identified. By combining these perspectives, a concrete picture of the required actions is formed.





Another key set of tools relates to the visibility and broader utilization of RDI infrastructures and their service interfaces in Finland. For example, various pilot and testing platforms are particularly important for the development of business and innovation. In education, research, and corporate collaboration, there is already a substantial resource base, but it is often underutilized. A key challenge has been that information about existing resources is fragmented, difficult to access, and often lacks clear service interfaces to engage with. In developing the SIX toolbox, efforts have been made to identify existing assets, increase their visibility in an industry-relevant way, and improve their usability through joint efforts with RDI infrastructure operators.

Not all tools are physical entities or clearly specified operating models. The industry-driven collaboration culture fostered by SIX differs from traditional ecosystems and is, in itself, a significant tool. In many research and innovation ecosystems, projects typically emerge from the initiative of local actors within the ecosystem. In SIX, however, any actor at the core of a cluster can take the initiative, initiate work, define the issue on the roadmap, and invite other actors to participate in different roles. In this sense, the industry-driven roadmap functions as an implementation framework. It is evident that the extent to which companies in particular have internalized this collaborative culture varies. Some operate actively in line with the model, while others have not yet fully adopted it.

Increasing understanding that every actor can—and is encouraged to—take initiative is a key development area for SIX clusters. At the same time, it is important to recognize that building a new, industry-driven operating culture takes time and requires sustained commitment.

The tools originate both from within SIX and from elsewhere. Some have been identified and further developed, others adopted as such. The content is diverse, but a common thread is clearly visible: **the SIX DNA lies in leveraging existing strengths, proactively anticipating issues, and bringing them together through industry-driven, practical collaboration.**



SIX Mobile Work Machines Cluster



The SIX Mobile Work Machines (MWM) cluster was established in December 2020. Its founding members included major mobile machinery manufacturers Cargotec (later Kalmar), Ponsse, Sandvik, and Valtra, as well as Valmet Automotive (now part of IONCOR). The decision to establish the cluster was preceded by a series of meetings in autumn 2020, where shared interests and objectives were mapped and the operating model was discussed.

“The discussion was then—and still is—open and constructive, because despite differences in business and applications, the solutions and technologies are largely shared, and we have common development needs,” says Kalle Einola, Research Director at Ponsse.

The vectors pointed in the same direction, and establishing a joint cluster was seen as a natural solution to advancing shared challenges. The SIX initiative, aligned with the defined objectives, was selected as the home for the cluster.

Two key background factors for the mobile machinery cluster:

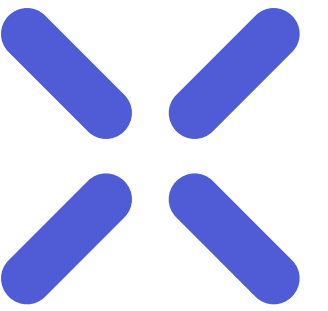
1. **The mobile work machines sector is at a pivotal point in its history, perhaps facing its largest disruption to date: as a result of the digital and green transition, almost everything is changing.**
2. **The sector is one of Finland’s most significant export industries in terms of prosperity and has strong growth potential of its own.**



The establishment of the cluster coincided with a major turning point from the perspective of companies’ offerings and operations. There were numerous new opportunities and challenges on the table. The partial electrification of machines as part of the green transition had gained momentum. At the same time, machines were becoming increasingly intelligent and autonomous. Solving the technological challenges related to these themes would have been a major task for individual companies alone, but collaboration was seen as a source of strength.

“For Valtra, collaboration has offered an opportunity to broaden perspectives through joint projects and discussions on key development priorities,” says Petri Hannukainen, Sr. Manager, Research & Advanced Engineering, at Valtra.

“We have shared best practices and jointly moved things forward,” continues Einola from Ponsse.



At the time of its establishment, the cluster was given a shared, ambitious vision, after which the operational objectives required to realize the vision were defined. The vision did not focus on the machine or innovation itself, but on the operating environment:

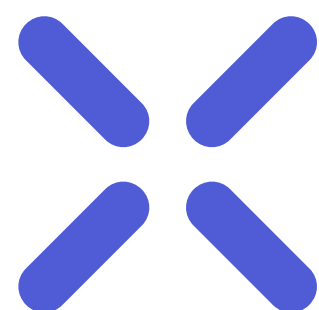
'By 2025, Finland will have become the world's best place for the development of mobile work machines and their core technologies and services.'

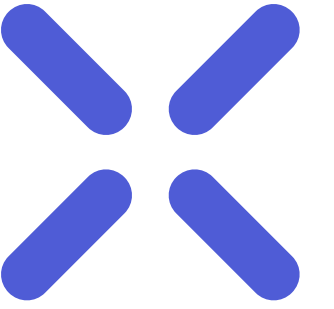
The vision was reflected into three objectives that also support SIX's overarching ambition of broad-based and impactful action:

1. Effective and efficient joint innovation development: Together, we enable the realization of company-specific and sector-wide digital and green transition objectives. Along this path, the cluster helps solve difficult and time-consuming challenges efficiently through close collaboration between industry and research. Everyone can draw from the results portfolio and leverage them for their own purposes.
2. Development of skills and talent availability: We enable the continuous availability of the skills companies need by jointly identifying future competence needs and focus areas within the sector and developing education accordingly.

3. Visibility and impact in Finland and globally: Together, we build stronger visibility for Finnish mobile work machine manufacturers both in Finland and internationally. By doing so, we attract investments and top global experts to Finland. Together, we influence funding, standardization, and other decision-making processes.

The new cluster emerged almost unnoticed as something unique. While similar types of joint initiatives exist globally, they are often application-area focused. In SIX Mobile Work Machines, the common denominator and area of interest is the machine itself, while purely application-specific issues are developed elsewhere by the respective actors.





Similarly, from the outset the aim was genuinely national-level action and impact.

Despite—or precisely because of—the national-level objectives, support from the regions was important. Business Tampere was therefore actively involved from the early stages, as the region has a strong concentration of mobile machinery manufacturing.

“Our role was partly to help get the activities started and then allow them to develop independently,” says Heini Wallander, Head of Industry at Business Tampere.

The cluster itself is not an end in itself. Collaboration was driven by shared objectives, and ultimately results are what matter. In this context, it is important to understand that not everything can be done at once or in parallel, and that prioritization is essential—one step creates the foundation for the next

“When we started establishing the cluster, we were not seen as an industry. Now we are,” notes Sandvik’s Jani Vilenius, summarizing one of the key achievements enabled by the Mobile Work Machines cluster.

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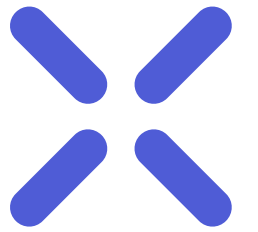
Actors and Operating Bodies

In the face of systemic challenges, broad-based and seamless industry–research collaboration is essential. For this reason, work within the cluster is carried out jointly across agendas, implementation planning, and execution itself.

Industrial companies play a leading role in the cluster, but research representatives have been involved at the core of the activities from the very beginning. In the early phase, the research organizations involved were Tampere University and VTT. Research actors have played an important role in developing the cluster and its tools, such as the shared roadmap.

In addition to machine manufacturers and research organizations, the core of the SIX Mobile Work Machines (MWM) cluster includes so-called key technology companies—actors capable of developing and delivering critical technologies for machine manufacturing, such as advanced solutions related to electrification. In the early stages, these included Valmet Automotive’s battery technology unit (now IONCOR), Epec, which belongs to the Ponsse Group and specializes in control systems, as well as Nokia, which develops connectivity capabilities. Over time, the group has expanded to include other necessary actors and solution providers. All of these participants contribute to the implementation of the cluster roadmap (Figure 3).





The steering group creates the conditions for the cluster's operations and development. As its name suggests, it guides the activities and is responsible for strategic decision-making. Machine manufacturers Kalmar, Ponsse, Sandvik, and Valtra formed the cluster's steering group at the outset together with the key technology partner IONCOR. In a supporting role, the steering group work has also involved Technology Industries of Finland, Tampere University, and VTT. The steering group has been very active, and participation has been strong.

"On the one hand, this has been required, but on the other hand, we have also experienced that we receive commensurate benefits from the activity," notes Kalle Einola.

"In the steering group, we share common concerns that go beyond technological issues, such as the availability of skills for the mobile work machines sector in the future, and we consider measures to address them. In this context, we have, for example, organized joint public events to increase the sector's visibility and attractiveness in the eyes of future professionals," Einola continues.

The steering group has also launched numerous activities related to the development of the operating environment, which are implemented as needed through dedicated, fixed-term task force groups.

"The ongoing infrastructure development work is a good example of a shared-benefit effort that can be carried out in this kind of consortium to serve a broad group of companies," mentions Valtra's Petri Hannukainen.

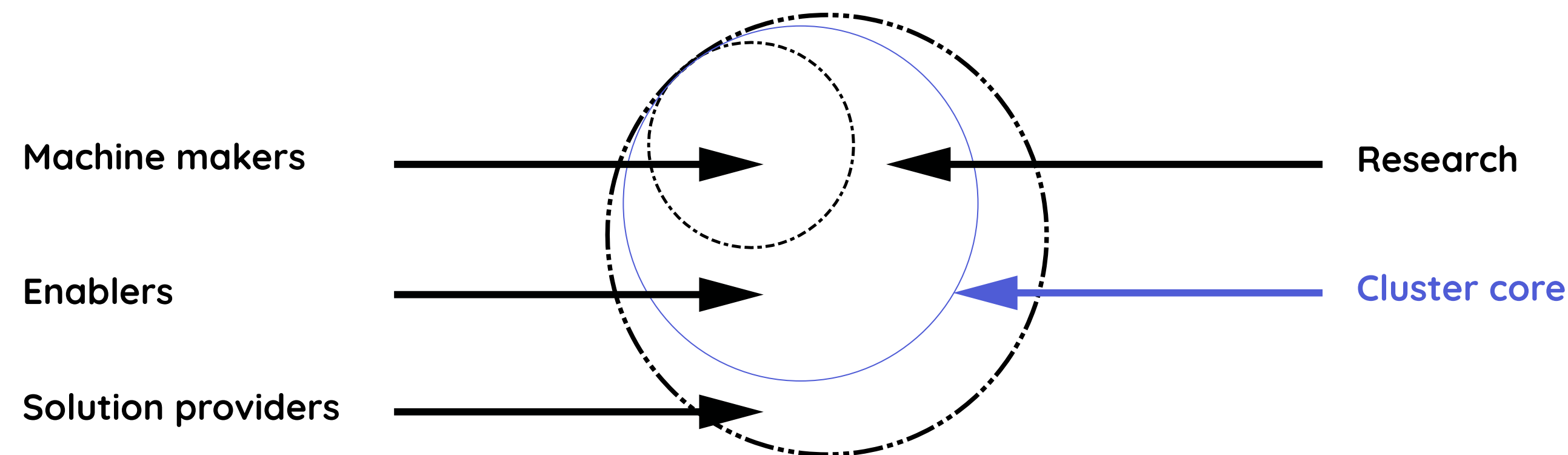
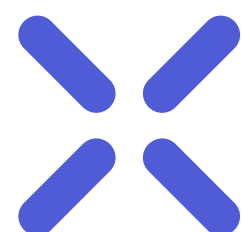


Figure 3. Actors in the SIX Mobile Work Machines cluster



The content group is another key body within the cluster. As its name suggests, it focuses on content-related matters. The content group owns the cluster's innovation development agenda and roadmap and is responsible for their maintenance and implementation. The group also prepares more strategic items related to the roadmap for decision-making by the steering group. The content group is composed of companies and research actors at the core of the cluster. It includes a total of eight companies as well as research organizations Tampere University (TAU) and VTT.

Achieving the objectives is not solely in the hands of the cluster actors; substantial external input is also required from Finland and internationally. Over time, the cluster has developed increasingly deep collaboration with key stakeholders critical to implementation. One of the most important of these is Business Finland. Through collaboration, its expertise and its ability to mobilize funding in ways other than traditional funding instruments have become essential tools for advancing the cluster's objectives

Discussions about structures and roles often begin before there is time to pause and reflect on what is actually being sought. When objectives are clear, structures can also be built to support them. Simplicity, agility, and enabling results-oriented collaboration have been guiding principles in designing and evaluating the SIX Mobile Work Machines structures. The aim has been to ensure that structures serve the activities, rather than constrain them.

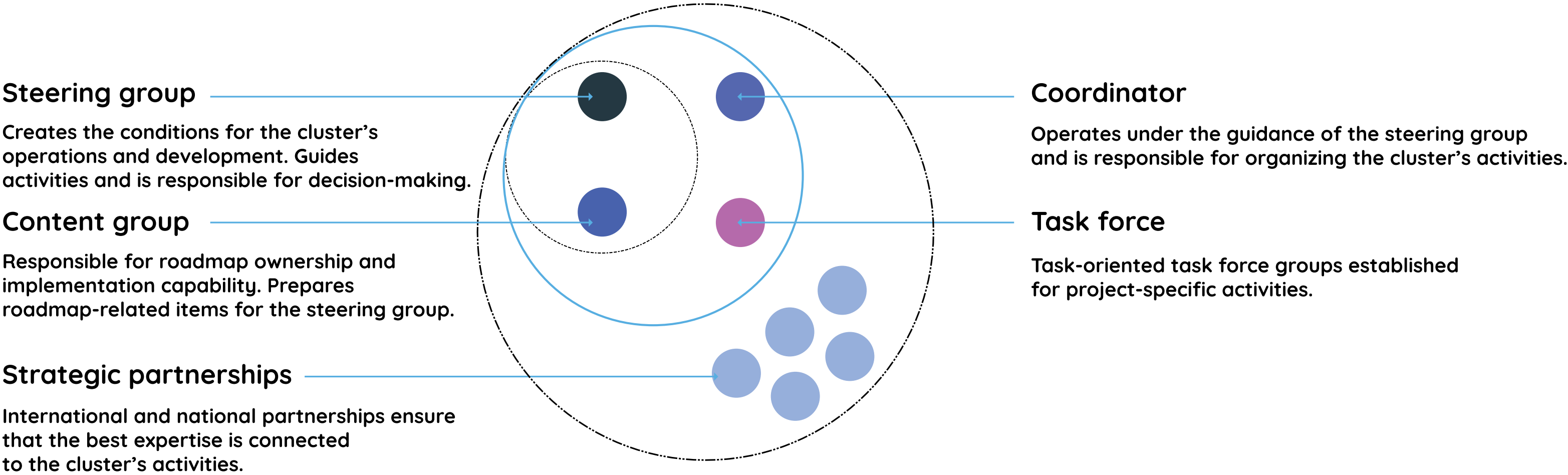
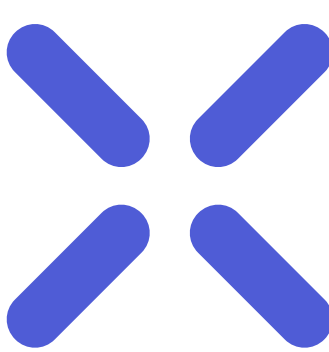


Figure 4. Structure of the SIX Mobile Work Machines cluster

A Shared Direction – The SIX MWM Roadmap

Without a shared objective and a clear path, activities remain fragmented and ad hoc. At the core of the SIX Mobile Work Machines (MWM) cluster is a shared cluster roadmap. Development of the first version of the roadmap began in winter 2021, immediately after the cluster was established.

The SIX MWM roadmap differs from traditional roadmaps in two fundamental ways. The first distinguishing feature relates to how the roadmap is created. In the initial phase, companies jointly developed an industry roadmap based on a shared vision, objectives, and identified drivers of change in the operating environment. In the second phase, research builds a corresponding response to the industry roadmap by addressing the question of what knowledge already exists and what research is required to enable the implementation of the industry roadmap.

When the industry and research roadmaps are ultimately combined, a third element is formed: an action roadmap—a description of the goal-oriented sequence of actions required (Figure 5).

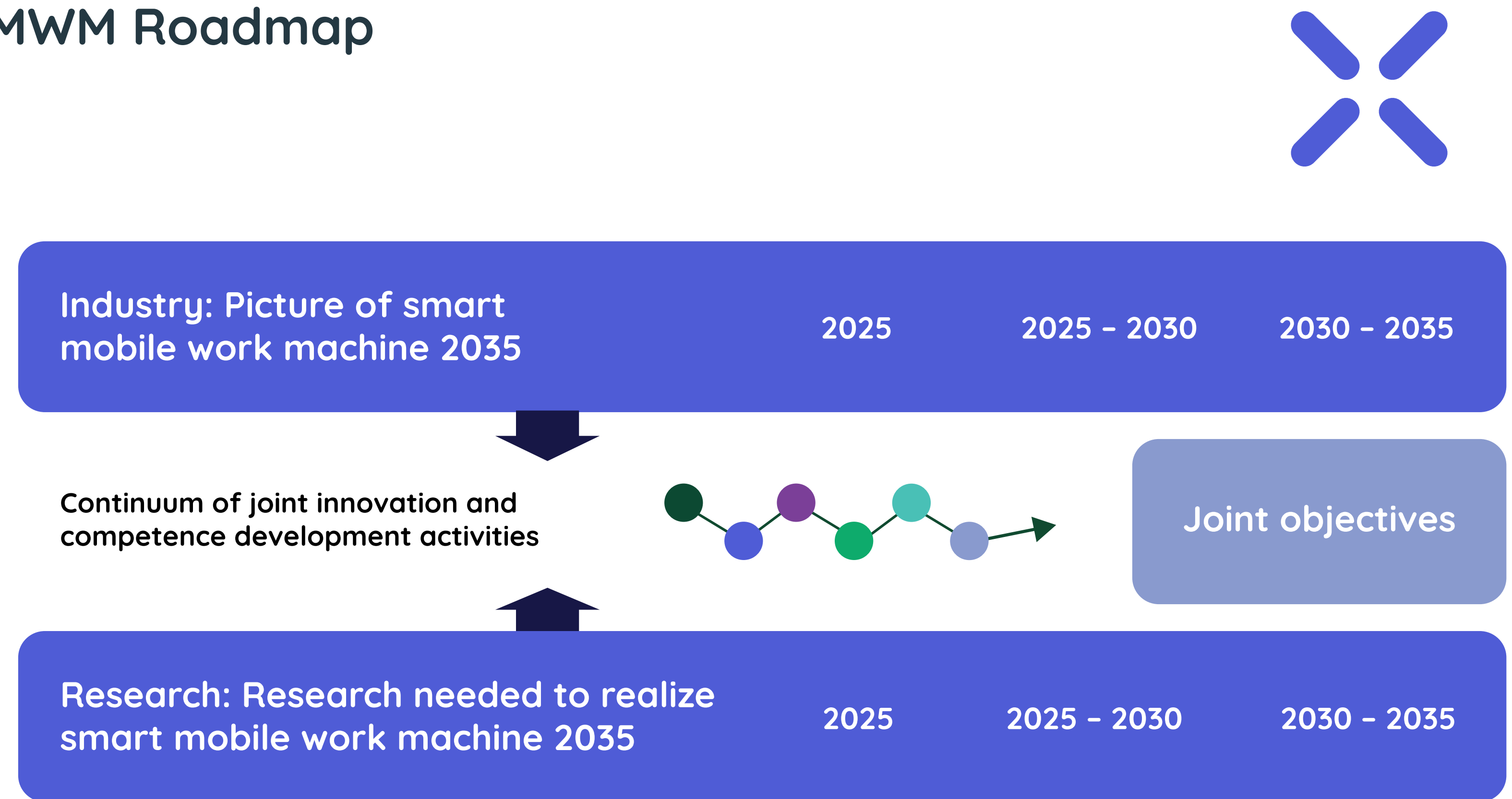
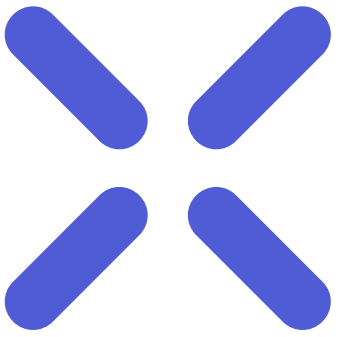


Figure 5. SIX Mobile Work Machines – the conceptual structure of the roadmap. The figure presents the updated roadmap at a conceptual level as of 2025.



The second distinguishing feature of the roadmap relates to the content of the industry roadmap and its strong practical orientation.

“When we started building the roadmap, we first created a vision of what an intelligent mobile work machine would look like in 2030, and defined what characteristics it would have. Only after that did we place those characteristics on the roadmap. Usually, roadmaps focus on required technologies,” says Pekka Yli-Paunu, Director, Research at Kalmar.

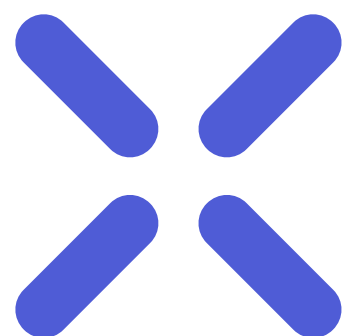
The industry roadmap of SIX MWM is therefore not a technology roadmap, but a description of the future mobile work machine in terms of its features, functionalities, and services. The first roadmap looked ten years ahead, toward the year 2030.

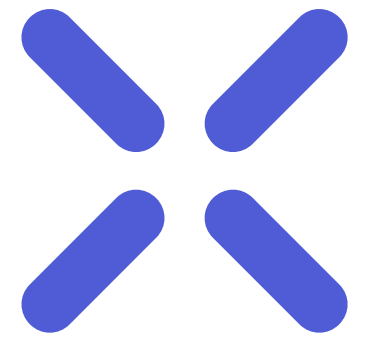
The characteristics of the intelligent mobile work machine were grouped under seven themes:

1. Autonomous & robotics solutions
2. Control systems for intelligence
3. Connected and communicating
4. Sustainable power solutions
5. Data intensive lifecycle services
6. Enabling new value from data
7. Human in the loop

(more on the themes at <https://www.six.fi/mobile-work-machines>)

After approximately three months of intensive work, the first version of the roadmap was completed, and the shared implementation journey began.





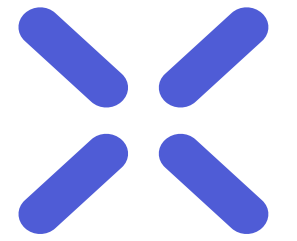
The roadmap has also proven useful and valuable from the perspective of individual companies. Pekka Yli-Paunu from Kalmar states: “The systemic approach of the SIX roadmap has resonated with us, and we have utilized it in our own roadmaps and project planning. The roadmap could certainly be used even more extensively in project development.”

Kalle Einola from Ponsse continues along the same lines: “The roadmap has provided a great deal of input, for example, for the development of electrification and autonomy. We also use it to time and structure research projects. The roadmap helps clarify which themes matter, when, and to which actors there are shared needs.”

Petri Hannukainen from Valtra also highlights two key implementation actions carried out with the companies in the cluster: “These have already taken place, and I believe there is even more potential in them going forward.”

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“When we started building the roadmap, we defined what characteristics the mobile work machine would have ten years ahead. Then we placed those characteristics on the roadmap.”



The world around us is changing. The cluster roadmap has been continuously maintained and updated annually. Adjustments are made to the thematic areas and their content over time as the roadmap implementation progresses. The update process has proven effective, but from time to time the overall content is expanded toward newly identified, useful directions. This also happened in 2025. The research response to the industry roadmap has now been developed on a broader basis, bringing research actors together around the same table through the Academic Fellows group (Aalto University, LUT University, University of Oulu, Tampere University, University of Turku, VTT).

The roadmap structure was also expanded with a new element: foresight. This enables a broader, longer-term perspective on future developments and preparedness for anticipated events. Foresight supports companies in longer-term implementation planning and ensures that research can stay two steps ahead of industry, thereby delivering greater value to industrial renewal.

As guided by the roadmap, “The mobile work machines of the future are task-centric, enable seamless operations, and generate new, previously unseen value across the entire value chain in which the machine operates. Sustainability is built in by design.” (Figure 6)

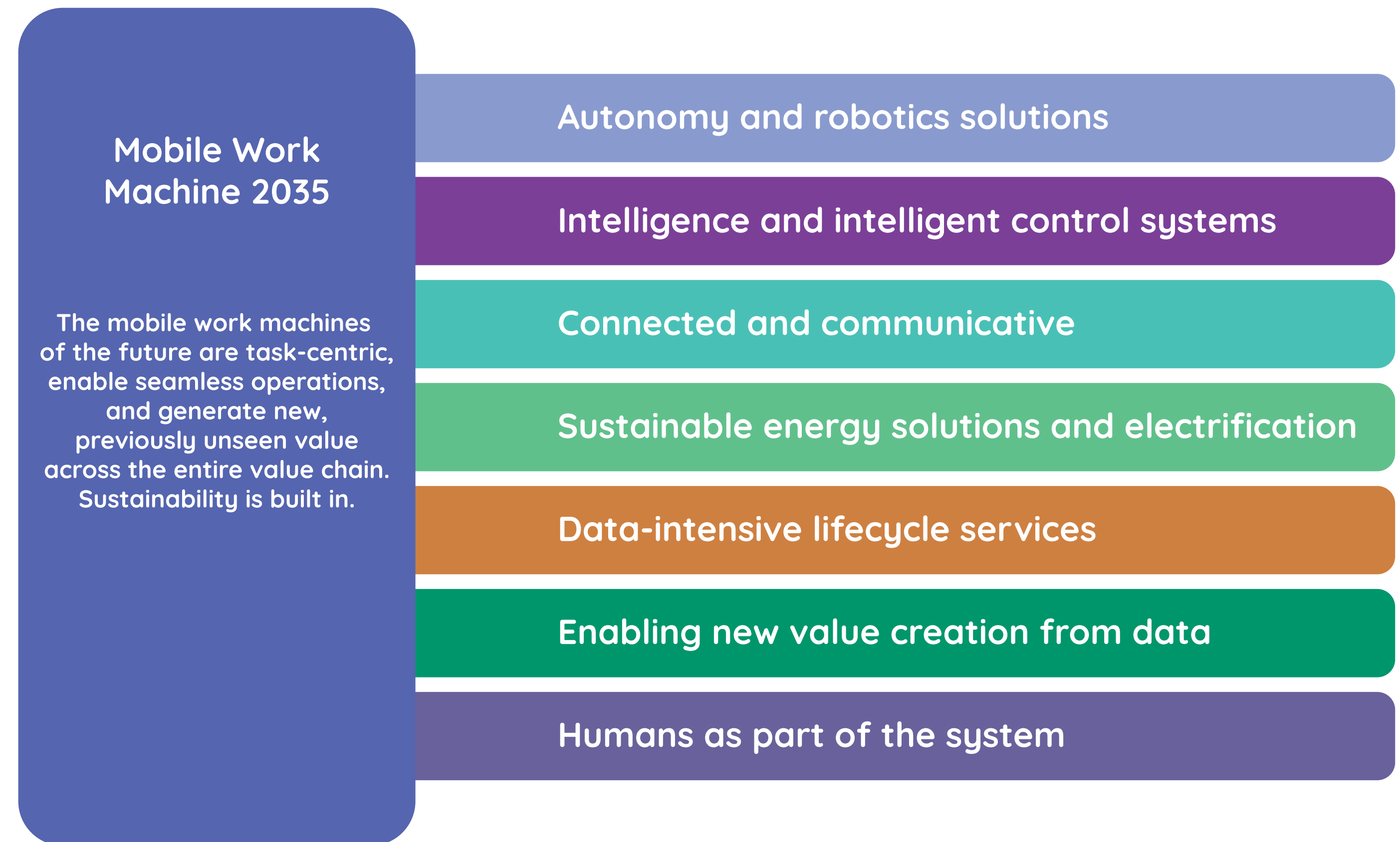


Figure 6. The 2025 SIX MWM roadmap vision of the mobile work machine and its key characteristics in 2035

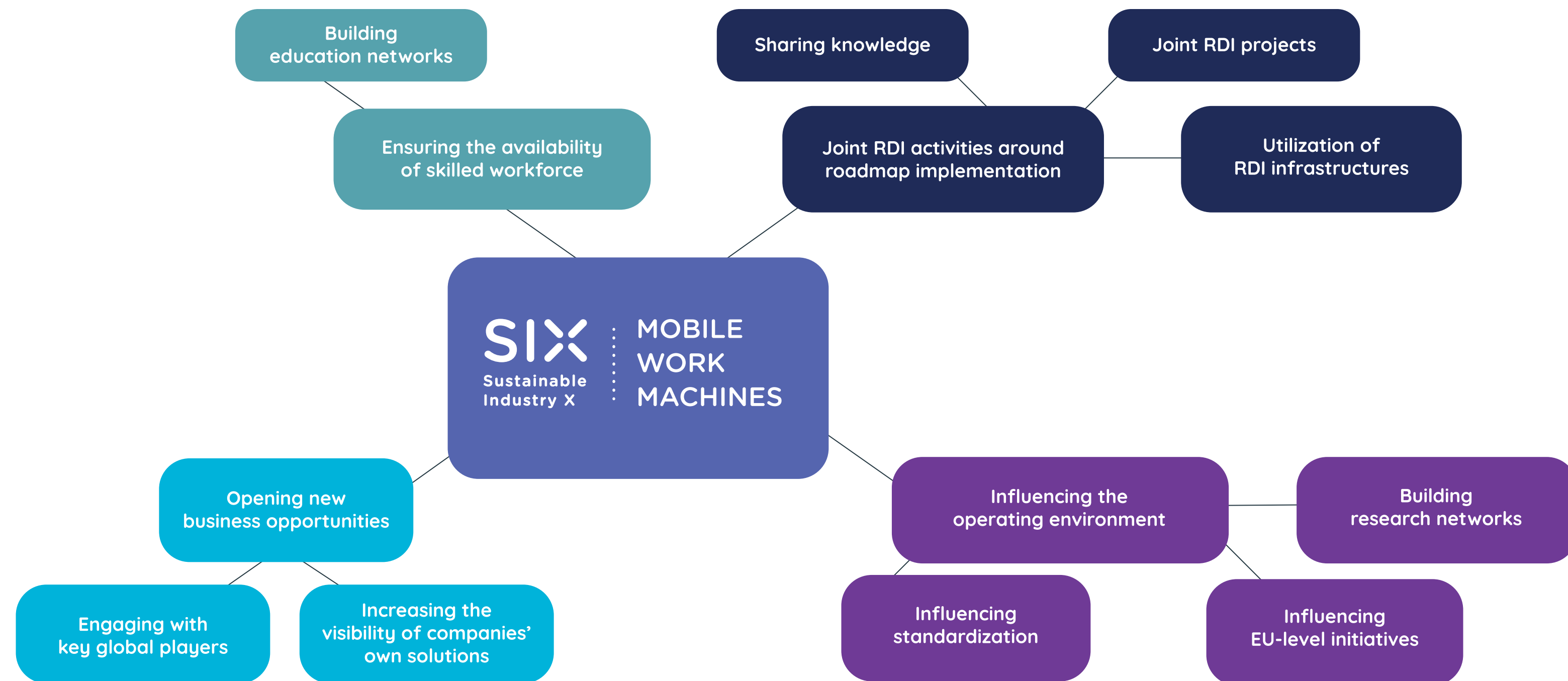
Activities of the SIX MWM Cluster

Today, the activities of the SIX Mobile Work Machines (MWM) cluster aim to generate impact across four distinct areas:

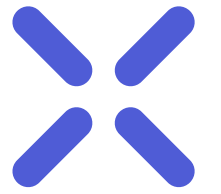
1. Joint RDI activities built around roadmap implementation
2. Influencing the operating environment
3. Ensuring the availability of skilled workforce
4. Opening up new business opportunities (Figure 7)

The scope of activity is broad, some of the areas are relatively young, and achieving the objectives requires long-term effort. More tangible impacts will only become visible over time. As Heini Wallander from Business Tampere reminds us: “Building impactful ecosystems takes many years.”

This account does not cover all activities carried out across these areas; instead, a few illustrative examples are highlighted.



Kuva 7. Activities of the SIX MWM Cluster



A New Approach to Research – Academic Fellows, the IWM Doctoral Program, and CORE

The research response to the first roadmap of the SIX Mobile Work Machines (MWM) cluster was prepared by Tampere University and VTT. However, it soon became clear that the required expertise does not reside at a single address. For this reason, it was considered essential to involve additional actors going forward.

“When we started discussing a new version of the roadmap in 2023, we wanted to involve other universities as well. A network was created and a mission document was prepared for it,” says Professor Matti Vilkkö from Tampere University. Research organizations from Aalto University, LUT University, the University of Oulu, Tampere University, the University of Turku, and VTT were brought together, leading to the establishment of the SIX MWM Academic Fellows network.

This type of industry-themed, practice-oriented research network was a new concept. In its formation, an important enabling factor was the SIX Platform of Excellence (SIX PoE) project led by Tampere University.

“The profile of mobile work machines within the university has become clearer and stronger through SIX activities, and there is a desire to further develop this profile in a systematic way through the Platform of Excellence project,” Vilkkö continues.

For the Academic Fellows network to produce the broad-ranging outcomes needed by industry, more than just a shared research roadmap and project implementation is required—additional long-term instruments are also needed.

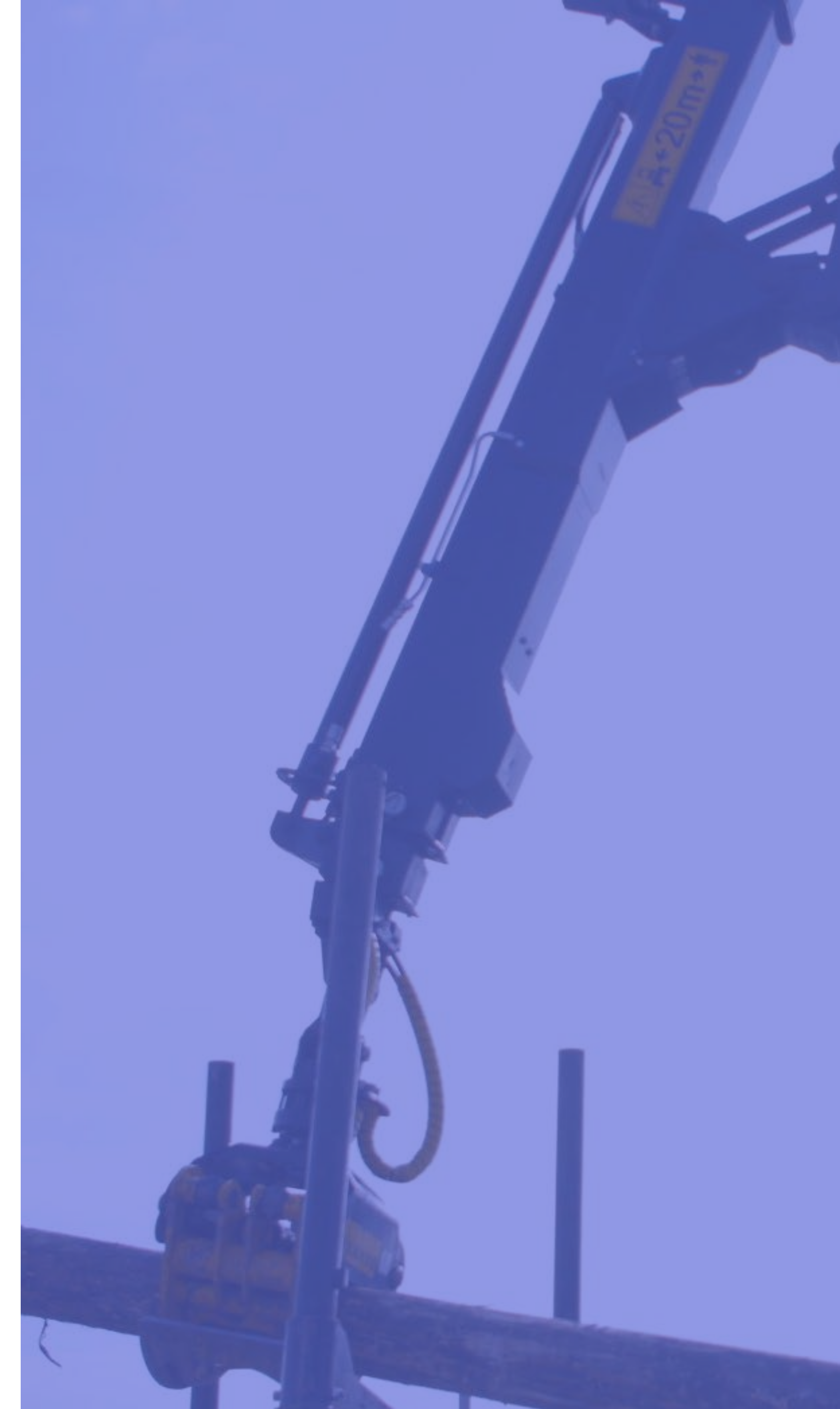
The Intelligent Work Machines (IWM) Doctoral Program is a key instrument for building top-level expertise in the field. The Academic Fellows group plays an important initiating and enabling role in this. The program educates a new generation of professionals all the way to doctoral level, producing multidisciplinary expertise and research results needed for the development of future intelligent work machines.

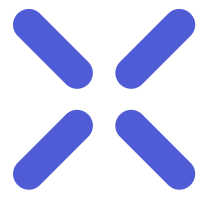
A joint doctoral education program connects top-level academic research expertise with research and development challenges that are critical for industry, accelerating the renewal of the sector. The program has a budget of EUR 8 million and includes 31 doctoral positions across five Finnish universities: Aalto University, LUT University, Tampere University, the University of Oulu, and the University of Turku.

Behind the internationally competitive, top-level research required by the sector is not a single university or discipline operating in isolation, but researchers working together. What is needed is even stronger alignment and a shared “think global” mindset. This is the direction now being taken. The Academic Fellows network of the five universities and VTT plays a key role in building a future competence center for mobile work machines.

The competence center is called the MWM Center of Research and Education Excellence (CORE). Its role is to bring together networked and continuously evolving top-level research, results with high utilization potential, and future-oriented education. Development that takes place jointly and as a whole does not disappear into abstraction; the benefits flow back to the individual actors involved and to the industrial sectors in which they operate.

“SIX MWM and MWM CORE are not only important for advancing research and business in the field, but they also significantly increase international attractiveness at a broader level,” states Heini Wallander from Business Tampere.





Influencing Opportunities – Influencing EU Task Force

Task forces are fixed-term working groups established for a specific, predefined purpose. In the SIX MWM cluster, however, the Influencing EU Task Force has evolved into a more permanent group that meets regularly. Composed of cluster actors and EU affairs experts, the group has two main tasks:

1. To scan and make visible research and innovation funding opportunities from EU instruments, such as Horizon Europe calls
2. To influence decision-making related to EU program content so that future calls better serve the mobile work machine sector

“There are no dedicated calls for mobile work machines in EU programs; instead, relevant topics are scattered across different programs according to technology themes, which makes identifying suitable funding opportunities challenging. Often, even calls that would otherwise be relevant exclude mobile work machine actors due to sectoral boundaries,” explains the task force lead, Research Manager Johannes Hyrynen from VTT.

“We have also shared experiences within the group on successful applications and acted as a dissemination channel for project ideas,” Hyrynen continues, describing the work of the Influencing EU Task Force.

Not all required expertise can be found in Finland. At the EU level, a well-networked task force has been a natural aid in promoting networking with foreign research institutes and other actors. In practice, this has been advanced, for example, by organizing themed visits.

Business Finland has been involved in planning and implementing most of these visits. Internationalization, however, is a demanding path, and opportunities are rarely readily available. Visits often serve as effective door-openers, but real collaboration usually only begins once a concrete joint project is launched. At the cluster level, only a limited number of international co-development projects have been implemented so far. One common challenge is precisely the scarcity of funding opportunities that enable such collaboration. As Kalle Einola from Ponsse notes: “Internationalization of the cluster has not progressed at the pace originally hoped for. New approaches are being sought and continuous work is underway. This ensures that SIX MWM does not remain overly national in its roadmap implementation.”

Growth Happens Only by Investing in Growth – A National Growth Strategy for Mobile Work Machines

Laying the foundation for the growth strategy began well before the actual decision to launch the strategy work. In Finland, there had been discussion about mobile work machines, and the significance of the sector was beginning to take shape, but in statistics and activities it was counted as part of manufacturing industry in general. The underlying challenge soon became evident: if the boundaries of a sector are not recognized, it is not possible to target meaningful measures at it. There was no clear sector classification in place. The SIX MWM cluster, together with Business Finland, carried out this definition work. This made it possible to arrive at concrete figures and facts.

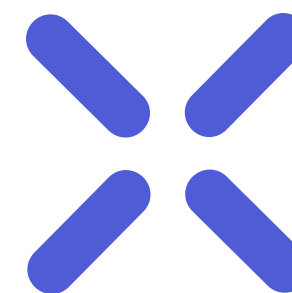
The mobile work machines sector is one of Finland's most important industrial sectors and has deep-rooted traditions in the country. The sector's total turnover in 2024 was approximately EUR 9 billion, accounting for more than 10% of Finland's exports of goods and services. Its employment impact is also significant: around 45,000 people in Finland earn their livelihood from the sector. When the ongoing transformation and the significant growth potential linked to the sector are also taken into account, it was natural for companies in the field, together with other stakeholders, to develop a growth strategy of their own.



The formation of the national growth strategy, involving industry, research, and public-sector actors, was launched in early 2025. The work was carried out jointly with Technology Industries of Finland, facilitated by Boston Consulting Group, and the results were decided to be published in summer 2025. The strategy was released by Technology Industries of Finland and given a descriptive title: Mighty Machines, Powered by Finland – Finland’s National Mobile Machine Growth Strategy 2035⁴.

The role of the SIX MWM cluster as an initiator and enabler of the strategy work was significant. According to Erkki Ahola, Director, New Technologies at Technology Industries of Finland: “SIX’s role began even before the actual strategy drafting. We already had something concrete on which to build the strategy. And that is a very big deal.”

The objective of the growth strategy is to elevate Finland to a global thought leader in the sector, triple the sector’s turnover, and double employment by 2035. Achieving these goals requires organic growth, expansion into international markets, but also the utilization of entirely new business opportunities enabled by mobile work machines. New value creation is also expected beyond the traditional boundaries of the sector.



“A strategy as a document means nothing unless it is put into action. People must be mobilized,” Ahola reminds us. “At SIX, we have a strong grassroots community and engaged stakeholders. This gives us the ability to influence policy-making.”

Kalmar’s Pekka Yli-Paunu supports Ahola’s view: “The sector needs a growth strategy, and it provides a strong foundation for deciding the next level. But monitoring and follow-up are absolutely critical—tracking how things are progressing and how much has actually been achieved.”

The growth strategy will only be realized if actors move in the same direction, commit to implementation, and jointly monitor the necessary development.

⁴ https://teknologiateollisuus.fi/wp-content/uploads/2025/08/Liikkuvien_koneiden_strategia_digi-1.pdf

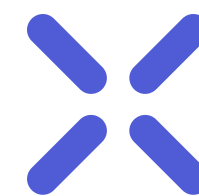
Coordination Activities & Events

Companies and research organizations carry out SIX activities largely on a pro bono or in-kind basis—meaning that each party contributes its own resources for the common good. Funding does not flow between actors; instead, work is done at one's own expense for a shared objective. This model has been natural for joint collaboration, but high-quality and large-scale implementation also requires professional coordination.

From the launch phase onward, Tamlink Ltd. has served as the coordinating organization of the SIX MWM cluster. One of the reasons for selecting Tamlink as the cluster coordinator was its long-standing collaboration with companies in the mobile work machine sector.

“The coordinator must be more than a secretary. To succeed, the coordinator must understand what we are actually trying to achieve,” says Jari Erkkilä, CEO of Tamlink.

The role of the coordinator within the cluster is to enable and support activities across companies—from strategic decision-making to content-related work related to cluster development. For companies, coordination is a service. To date, the basic funding for SIX MWM cluster coordination has been provided by the participating companies themselves. In addition, company-specific development funding from Business Finland has been utilized to support the development of operations. “We are a professional project management organization; we cannot operate on goodwill alone,” Erkkilä continues.



The activities of the SIX MWM cluster have been in continuous growth. The scope of activities has expanded significantly, which has also created new challenges for coordination and resource allocation. As part of this growth, the cluster's visibility and its ability to engage actors beyond its immediate core have been recognized as critically important—and have been actively strengthened.

Events serve as a good example of this development and have grown year by year in both scale and impact. One notable example is the Future Mobile Work Machines event, which in October 2025 brought together approximately 300 participants, 12% of whom were international visitors. In coordination, efforts have also been made to identify synergy benefits. In addition to coordinating the SIX MWM cluster, Tamlink Ltd. is responsible for communications across the entire SIX initiative.

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Business Finland-funded projects are underway or already completed within the cluster: 13 projects with a total volume of EUR 19.2 million. 9 EU-funded projects are underway.

At the time of writing this account, five years into the SIX Mobile Work Machines cluster, the core group comprises 42 companies. Solution providers include 8 companies, and through the Academic Fellows network, 6 universities and research institutes are involved. Business Finland-funded co-research or co-innovation projects have been launched or completed within the cluster: 13 projects with a total combined volume of EUR 19.2 million. In addition, 9 EU-funded projects are currently underway. The Future Mobile Work Machines event has been organized for four consecutive years, with the two most recent editions implemented together with FIMA, which has now merged into the cluster.

Activities do not emerge out of nothing; they require both time and funding. However, not all joint efforts are directly visible in official reporting.

At the cluster's request, the coordinator Tam-link assessed how much working time companies participating in the SIX MWM cluster devote annually to enabling cluster activities (steering group, content group, so-called Forest Days, task force activities, events, networking trips abroad). When aggregated, cluster companies invest at least approximately 2,500 working hours per year in joint meetings alone, corresponding to roughly 16 person-months annually. On top of this comes preparation work within companies for joint events and activities, which is not included in this figure. In total, this easily amounts to more than 30 person-months per year. The estimate does not yet include direct project work, which would multiply the level of company investment. The willingness of actors to invest their own time beyond funded activities sends a strong signal about the perceived relevance and value of the work.

Vision 2025 – Retrospective

“By 2025, Finland has become the world’s best place for the development of mobile work machines and their core technologies and services.”

The initial vision of the SIX Mobile Machines cluster was ambitious. It was connected to the world’s best operating environment and extended to the year 2025. When the vision was created, it was broken down into concrete elements and defined what needed to happen in order for us to be able to say that our operating environment is the best in the world.

The year 2025 has passed, and we have a responsibility to look in the mirror. Many of the objectives linked to the vision have been achieved, or at least substantial work has been done toward them. The journey is well underway and the direction is right—although it would be difficult to claim that the world’s best operating environment has already been fully achieved.

Bringing Forces Together: A sustainable and evolving industrial cluster is in place and acts as a driver of development.

- ✓ The cluster was established on an industry-driven initiative in December 2020. A shared vision, objectives, and an operational roadmap have guided the work and continue to do so. The cluster’s activities and development have been deliberately anchored on a sustainable foundation.
- ✓ The number of committed contributors has steadily increased. We are able to broadly engage all key actors required for implementation: OEMs, key technology partners, solution providers, and research organizations.
- ✓ The cluster’s activities are funded in a sustainable manner through multiple channels (industry, Business Finland, regional actors, the EU, etc.).
- ✓ SIX Mobile Machines has become a recognized brand. We are known within the sector and are used as an example of effective collaboration. We have been invited to speak at numerous events in Finland and internationally. The Future Mobile Work Machines event has established itself as a respected agenda-setting forum.

A Shared Agenda: An operational and widely recognized roadmap serves as a common compass.

- ✓ A continuously updated and evolving roadmap guides day-to-day activities and enables the systematic development of an expanding portfolio of actions. We have succeeded in building goal-oriented continuums and engaging key partners in internalizing their importance.
- ✓ The core content of the roadmap is visible, attracts the necessary actors, and supports the building of Finnish thought leadership also in the international arena.
- ✓ The roadmap’s implementation portfolio is credible and has been realized with the necessary broad-based support through a distributed model. Different funding instruments are used in a versatile and needs-driven manner. Activities engage a significant number of actors also beyond the core of the cluster.
- ✓ The future is examined not only through the roadmap but also via foresight. This strengthens industry’s ability to continuously renew itself.

The sector is recognized in Finland and is now also taken into account in decision-making. “It is no longer just one part of our manufacturing industry.”

- ✓ “We have put the mobile machinery industry on the map.”
- ✓ The sector has been defined and its boundaries are now understood. Its potential is visible, and it has become possible to target concrete measures toward it.
- ✓ An industry-driven national growth strategy has been created for the sector.
- ✓ Influencing has been embedded as a core element in enabling roadmap implementation. Influence has not been limited to lobbying alone, but is carried out through evidence, visibility, and practical collaboration. Influencing activities also extend to the EU level.

Teams have been brought together and are actively working to develop top-level research and to secure the availability of talent.

- ✓ The Academic Fellows group, bringing key research actors to the same table, has been established and is active. Members include Aalto University, LUT University, the University of Oulu, Tampere University, the University of Turku, and VTT.
- ✓ A research roadmap has been created through the work of the Academic Fellows group. The roadmap serves industry as a “yellow pages” of research and supports research organizations in developing their own content.
- ✓ A joint Intelligent Work Machines (IWM) doctoral program for research organizations is in place and is producing doctoral graduates and research results.
- ✓ A pilot of competence profiles has been completed. The developed tool can be used to support the joint development of industry-education training programs and their content.

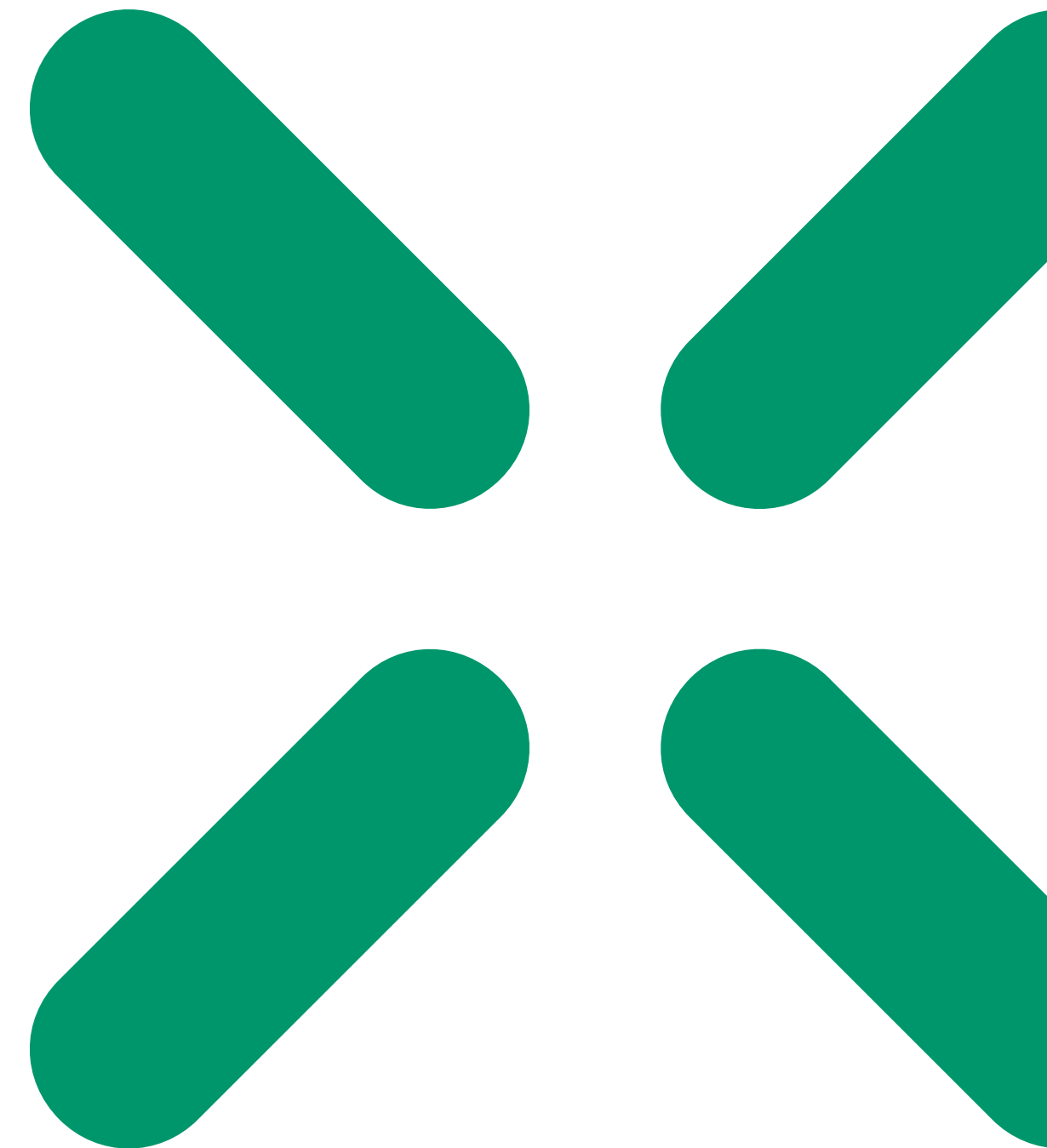


Growth of SIX

SIX Mobile Work Machines has not remained the only industry cluster operating under the SIX initiative. Three additional clusters have joined the portfolio: SIX Smart Manufacturing, SIX Heavy On-road Vehicles (HOVE), and SIX Elastomeric Systems.

All of these clusters have emerged from industry-driven initiatives, following the same principles as SIX MWM. Each cluster has its own specific characteristics, while sharing a common agenda and several shared tools. These include, for example, the roadmap-driven operating model developed within the initiative to guide cluster activities.

In addition to industry clusters, the SIX initiative umbrella also includes collaboration among regional actors that support the achievement of shared objectives through the SIXNET network.



Creating New Value from Intelligent Manufacturing – SIX Smart Manufacturing



The objective of the SIX Smart Manufacturing cluster is to act as an enabler of broad-based collaboration in manufacturing and to drive a paradigm shift in Finnish discrete manufacturing. Through this paradigm shift, the aim is to move away from cost-driven manufacturing thinking and to awaken interest in manufacturing innovation as a source of new value. Successful transformation helps create unique competitive advantages for manufacturing companies. Research Director Antero Kutvonen from LUT University expresses the cluster's objective from a slightly different angle: "The purpose is to restore manufacturing to its rightful value and to make it an attractive field of work again—one that people actively seek out." This emphasis is particularly important at a time when manufacturing companies are facing an increasingly severe shortage of skilled professionals.

Discussions on establishing the Smart Manufacturing cluster were already taking place in 2020 alongside the launch discussions of the Mobile Work Machines cluster. In the case of Smart Manufacturing, however, progress was slower and followed a different path. There were two main reasons for this.

The first reason relates to the role of manufacturing in the overall system. In Finland, there are many companies that control demanding manufacturing processes, but there are comparatively few actors that develop manufacturing solutions themselves. Manufacturing is therefore viewed more naturally as a "tool" than from a product perspective, which is reflected in the interests of actors and in the way manufacturing-related development work is approached. The starting points were thus clearly different compared to the already more established mobile work machine cluster

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The purpose is to restore manufacturing to its rightful value and to make it an attractive field of work again — one that people actively seek out.



The second reason was related to the ecosystem field. Manufacturing is, in many ways, highly fragmented. For Finland, the importance of the topic was already evident, and there were several ecosystems focused on manufacturing development, such as MEX Finland, Re-boot IoT Factory, and the Finnish Advanced Manufacturing Network (FAMN) launched earlier. However, building operations primarily on individual projects did not support large-scale development across Finland. At that moment, it was necessary to pause and reflect on what was missing. The need for a shared agenda became clear. Similarly, the new approach to scaling up results developed around the Re-boot IoT Factory project provided a foundation. SIX Smart Manufacturing began to take shape from this starting point, and the creation of a shared roadmap was the first concrete step taken at the practical level.

“Fastems wanted to get involved immediately when we started talking about building a roadmap for manufacturing industry,” says Matti Saarinen, R&D Project and Portfolio Manager at Fastems.

The roots of the now well-known Smart Manufacturing 2035 roadmap lie in the objectives presented by companies involved in SIX Smart Manufacturing (ABB, Fastems, Nokia, Ponsse, Sandvik). These objectives were gathered and consolidated into roadmap form through company workshops held between 2021 and 2022. Written objectives cannot realistically be advanced from the perspective of a single actor alone—genuinely impactful implementation requires broad-based collaboration. Based on this understanding, discussions were initiated among three manufacturing ecosystems. Representatives from FAMN, MEX Finland, and SIX Smart Manufacturing (later FAMN and MEX Finland merged into Make in Finland) came together, and the idea of joint ownership of the roadmap gained support. As the journey progressed, different ecosystems contributed their input to the roadmap content, and the roadmap was further refined.

Business Finland published the joint Smart Manufacturing 2035 roadmap⁵ in 2024. The roadmap has sparked considerable interest and has also been referenced in Finland’s industrial policy strategy⁶.

The thematic areas of the roadmap are:

1. Manufacturing smartness
2. New work
3. Green manufacturing
4. Leveraging supply network
5. Novel manufacturing technologies and paradigms
6. Autonomous operation and automation

The roadmap contains many strong objectives and future-oriented directions, but implementation requires stronger commitment and momentum. “We can see that the roadmap and the SIX cluster help in building large project consortia and in launching projects around themes that are important to us. This has happened, but the starting pace has been slower than expected,” notes Fastems’ Saarinen.

⁵ Nieminen, H., Juvansuu, M., Karjaluoto, A., & Lanz, M. (2024). Älykäs Valmistus 2035 Tiekartta. Business Finland. <https://www.businessfinland.fi/julkaisut/alykas-valmistus-2035-tiekartta>

⁶ Valle, A & Palmu, M. (toim.) (2024). Teollisuuspoliittinen strategia – Ohjausryhmän raportti. TEM 2024:49. <https://urn.fi/URN:ISBN:978-952-327-600-0>

SIX Smart Manufacturing differs in both structure and operating model from other SIX clusters, as well as from other manufacturing development initiatives. At a high level, the cluster seeks to create a clear shared direction for the future development of manufacturing in Finland. It advances this by bringing effective tools to the table. These include the national-level roadmap and its implementation-related structures, both of which have been jointly developed and maintained in close collaboration with industrial actors under the broader Make in Finland umbrella. The cluster also aims to promote the diverse research–industry collaboration required for implementation. The SIX Manufacturing Academic Fellows group brings together key individuals from eight Finnish universities and research institutes (Aalto University, LUT University, University of Oulu, Tampere University, University of Turku, Åbo Akademi, University of Vaasa, VTT) to advance innovation and top-level expertise in manufacturing industry.

The group is responsible for updating the smart manufacturing roadmap and for advancing perspectives related to research and education. At the same time, it enables the necessary broader dialogue between academic actors and industry.

Within the cluster's sphere of activity, there are five companies representing different directions and eight universities or research institutes (p. 70). Through indirect influence, a significantly broader company network is also involved.

According to Antero Kutvonen from LUT University, "SIX is one of the few networks that provides a direct connection to industry. It has also succeeded in getting all research organizations to view the activity from a national perspective."



Towards Sustainable Heavy On-Road Transport – SIX Heavy On-Road Vehicles



SIX Heavy On-Road Vehicles (SIX HOVE) is the third cluster established under the SIX initiative. The cluster focuses on technologies related to the electrification of heavy on-road transport, the development of required capabilities, and societal impact—covering issues related to advocacy, regulation, and other decision-making processes.

The energy transition in road transport is advancing, but in the case of heavy on-road transport the situation is still relatively new. Many open questions remain, technological development is rapid, and this is clearly reflected in the cluster's activities.

"SIX HOVE was created to increase overall understanding of the challenges and opportunities of electric heavy transport by bringing together a critical mass of relevant stakeholders. When the cluster was formed, there were no commercially viable electric heavy trucks available, nor suitable charging infrastructure. Everything was new," says Minna van der Most, Logistics Development Manager at SSAB Europe.

In line with the cluster's vision: "By 2035, Finland's heavy on-road transport will be sustainable (people, profit, planet) and will also set the direction at the global level. It will enable the creation of entirely new value across the whole value chain." According to the vision, the path to the future is guided by the cluster's roadmap and by Business Finland's roadmap Sustainable Heavy On-Road Transport 2035, published in 2025.⁷

The roadmap covers six thematic areas:

1. Sustainable business
2. Zero-emission system
3. Control systems for intelligence
4. Customer / human in the loop
5. Data-intensive services, connectivity and intelligence
6. Autonomy / automation in logistics

⁷Nieminen, H., Hyrynen, J., Pihlatie, M., Kallionpää, E., Liimatainen, H. (2025) Kestävän raskaan tieliikenteen tiekartta. Business Finland raportti 7-2025.

https://www.businessfinland.fi/globalassets/julkaisut/business_finland_tiekartta_2035_raportti_2025-7.pdf



Development related to technical solutions plays a key role in progressing toward the objectives outlined in the HOVE roadmap. Particular emphasis is placed on the ability to advance systemic change across the broader system. In SIX HOVE's activities, special attention has been paid to this aspect.

"HOVE brings together the expertise of specialists from several different fields into a coherent whole, enabling the energy transition to be advanced in a more efficient manner," says Pasi Salmela, Senior Advisor at Rauanheimo.

In many respects, the sector is breaking new ground, but at the same time the operating environment requires tangible results in a relatively short timeframe. The potential benefits of joint development are significant. "With a large group, for example, it would be good to consider process changes that fully electric fleets require and bring about," Salmela continues.

The green transition is one of the key drivers behind all SIX initiative activities, but it is most concretely visible in the work of the SIX HOVE cluster. Electrification of heavy road transport would most likely not have risen to such a prominent topic without the climate and other environmental objectives set by the green transition. Because the shift toward new sustainable solutions is still at an early stage and, on the other hand, the response is a transition from fossil-fuel-based systems to entirely new infrastructure, societal impact that requires critical mass of knowledge plays a major role in the cluster's activities.

Salmela from Rauanheimo notes: "The cluster has been very proactive in identifying influencing opportunities and in building solid arguments for actions that would, in practice, enable the business case for electric fleets during the transition phase."

At present, the SIX HOVE cluster includes 10 companies and two universities or research organizations (p. 69).

Competitive Advantage from Sustainable Materials

– SIX Elastomeric Systems

In Finland, there are numerous companies focused on the development and application of elastomer materials, such as rubber. The value chain is extensive, but in recent years development activities have been fragmented and limited in scope. This has slowed down the development of expertise, and many companies in the field are struggling with a growing shortage of skilled professionals. At the same time, the global environment is changing. Today's elastomer products are largely based on fossil-derived raw materials, but significant changes are expected in this field in the coming years: fossil resources are diminishing and their use is being restricted, harmful substances are being banned, alternative materials are being developed, the use of renewable materials is increasing, and the importance of recycling is growing.

Can we, for example, identify local raw materials, processes, and product innovations that could create a unique competitive advantage for Finland?

SIX Elastomeric Systems is the newest addition to the SIX cluster family, launched in summer 2025. The cluster aims to respond to the changing needs of industries operating in the elastomer materials field—particularly those driven by the green transition, digitalization, and skills shortages—by intensifying collaboration between research, education, and companies. Sustainable materials and the intelligent products based on them open entirely new opportunities for actors. This moment of disruption presents a clear opportunity, which is why the cluster emerged precisely at this point in time.



Black Donuts' VP Sirkka Hagman states: "The general level of expertise in Finland has declined from where it once was. We wanted to respond to this change. A couple of years ago, we received EU investment funding to establish a top-level research laboratory in connection with Hervanta campus of Tampere University, and we wanted to open this facility to others as well."

Professor Essi Sarlin from Tampere University continues: "In Finland, there are several small companies in the field that share common research needs, but lack the resources and their own facilities to tackle major challenges."

The cluster's vision is to enable new value creation and competitiveness by transitioning to sustainable raw materials and by developing advanced materials that promote innovation and top-level expertise. In the familiar SIX cluster approach, the roadmap brings actors together and provides direction for development.

In the familiar SIX cluster approach, the roadmap⁸ brings actors together and provides direction for development.

⁸ More on the themes: www.six.fi/elastomeric-systems

The roadmap themes are currently:

1. Sustainable material design and innovation
2. Advanced processing and manufacturing
3. Applications and integration
4. New value from data and data intensive features / services
5. Customer / human in the loop

"Next, we need to achieve concrete outcomes," says Essi Sarlin about the plans of the young cluster. If successful, the cluster has strong prerequisites to advance Finland's position as a forerunner in sustainable and innovative material solutions and in high value-added products manufactured from them.

At present, SIX Elastomeric Systems cluster activities involve six companies and three universities or research institutes (p. 71). The table has been set for an expanding group of participants.

Industrial Regions Together – SIXNET



SIXNET is a network of regional development organizations that supports the SIX initiative by strengthening interregional collaboration and bringing a regional perspective into SIX activities and agenda development. The network is built on the understanding that Finnish competitiveness does not arise solely from the strengths and achievements of individual regions, but from how well regions are able to connect with one another and leverage industrial capabilities in a practical, industry-driven manner.

Manufacturing industry in Finland operates as a network. Companies' value chains, expertise, and investments cut across regional boundaries. Each industrial region has its own distinctive strengths and activities associated with significant synergy potential. When a region develops new services, operating models, or focus areas, these can, at best, benefit the entire Finnish industrial landscape—not only local companies. For this reason, regions should not compete against each other, but actively build shared ecosystems in which information, expertise, and resources move smoothly.

SIXNET serves as a shared platform for industrial regions, providing services and operating models that support the renewal of manufacturing industry nationwide. Through the network, information and best practices are shared and joint development projects are advanced. Industrial companies can also leverage the network in identifying and accessing the expertise they need. Currently, SIXNET includes 10 industrial regions, and the network continues to expand (p. 71).

Building on the existing portfolio, SIXNET has also developed new shared services together with its members, targeted at companies across Finland. Good examples the SIXNET service include Valmistusklubit (Manufacturing Clubs) and SIXLabs. Valmistusklubit are events where manufacturing companies, experts, and other stakeholders meet to exchange knowledge, learn, and co-develop solutions. SIXLabs, in turn, aggregate information on regionally located learning environments, testing facilities, and TKIO (research, development, innovation, and learning) infrastructures, making these assets visible and accessible at the national level. To support the utilization of TKIO infrastructures, a shared playbook has been developed.

The SIXNET network is a strong—though still relatively rare—example of externally funded, sustained collaboration between regions. The network initially operated as part of a project funded by the Ministry of Economic Affairs and Employment, with Business Tampere acting as the network coordinator during the implementation phase. Since then, the network has continued operating on a self-funded basis, with coordination rotating among members

Pia Niemikotka from the City of Hämeenlinna describes the benefits of SIX and the SIXNET network from the perspective of Hämeenlinna: "The SIX network has enabled our companies to access a broader TKIO service portfolio beyond our own region and to strengthen regional vitality through joint EU projects. Our region's frontrunner companies and their examples have gained national visibility through SIX, but conversely, through SIXNET our companies have also found new collaboration partners from other regions."

Not Everything Goes Through – The Industrial Agenda Roundtable

Not all plans and proposals under the SIX initiative have reached the finish line. Some have failed “technically.” Some have stalled during implementation due to a lack of resources or interest. Some simply have not yet had the opportunity to progress to implementation. The planned industrial agenda roundtable is one example of this.

The roundtable was planned in collaboration with the Ministry of Economic Affairs and Employment’s AI 4.0 program. In the program’s final report⁹, it was mentioned as a key program-level recommendation: “The Ministry of Economic Affairs and Employment, together with its administrative branch and stakeholder-based industrial ecosystems, should establish a strategic-level roundtable focusing on the twin transition of industry, supported by a secretariat, to steer the implementation of the technology and industrial agenda and roadmaps.”

Behind the proposal was a shared concern among program participants that the measures described in the final report would remain unimplemented unless initiatives that emerged during the program were taken forward and guided after the program ended in spring 2023.

A similar need for a roundtable was recognized more broadly across the industrial field. For example, the SIX-agenda¹⁰ highlighted the need for a coordinating body that would bring together actors responsible for implementing Finland’s digital and green industrial transition, in order to advance the execution of national plans more effectively than at present.



The concept of the industrial roundtable was developed by a working group that included representatives from key industrial ecosystems, labor market organizations, business associations, companies, research, education, funding bodies, and ministries. The working group’s output was captured in the AI 4.0 program’s final report and further elaborated in a separate document.¹¹

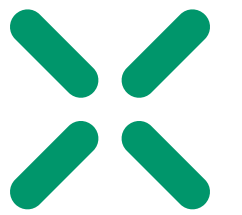
Utilizing the planned model would have required a political decision. In the absence of such a decision, the industrial agenda roundtable has not, so far, been established. Nevertheless, the need for a broad-based actor that accelerates the practical implementation of good plans remains clear.

⁹ Työ- ja elinkeinoministeriö (2022). Tekoäly 4.0 -ohjelma: Suomi kaksoissiirtymän suunnannäyttäjänä – Tekoäly 4.0 -ohjelman loppuraportti. TEM 2022:60. <https://urn.fi/URN:ISBN:978-952-327-997-1>

¹⁰ Paasi, J., Nieminen, H., Salminen, K., Apilo, T., Heilala, J., & Virkkunen, R. (2022). Sustainable Industry X: Suomalaisen teollisuuden uudistumisagenda. VTT Technical Research Centre of Finland. VTT Technology No. 410 <https://doi.org/10.32040/2242-122X.2022.T410>

¹¹ Paasi, J., Nieminen, H., & Hentilä, S. (2023). Teollisuuden pyöreän pöydän käsikirja. VTT Technical Research Centre of Finland. VTT Technology No. 416 <https://doi.org/10.32040/2242-122X.2023.T416>
Paasi, J., Nieminen, H., & Hentilä, S. (2023). Teollisuuden pyöreän pöydän käsikirja. VTT Technical Research Centre of Finland. VTT Technology No. 416 <https://doi.org/10.32040/2242-122X.2023.T416>

Towards the Future – SIX 2.0



The growing complexity of the Internet of Things, the multi-layered use of data, rapid advances in artificial intelligence, and the wide-ranging requirements of the green transition are all essential factors shaping future solutions in an increasingly systemic way. This naturally challenges traditional operating models, actors, and organizational boundaries. Industrial clusters are moving toward closer collaboration, and the greatest value and innovation are increasingly created at the interfaces between different activities and sectors—rather than within traditional silos. New, significant opportunities are emerging, and SIX 2.0 has been designed to capitalize on them.

In its current form, SIX 1.0 clusters operate under a shared SIX agenda, but in many respects still within their own silos (Figure 8). SIX 2.0 seeks to dismantle not only cluster-specific silos, but also the silos of the overall SIX entity. In this model, clusters continue to develop their activities independently according to their actors and needs, but with greater awareness of the broader system. SIX 2.0 brings clusters to operate as part of a shared value network and builds stronger linkages between the SIX initiative and external sectors, competence concentrations, and development activities (Figure 9).

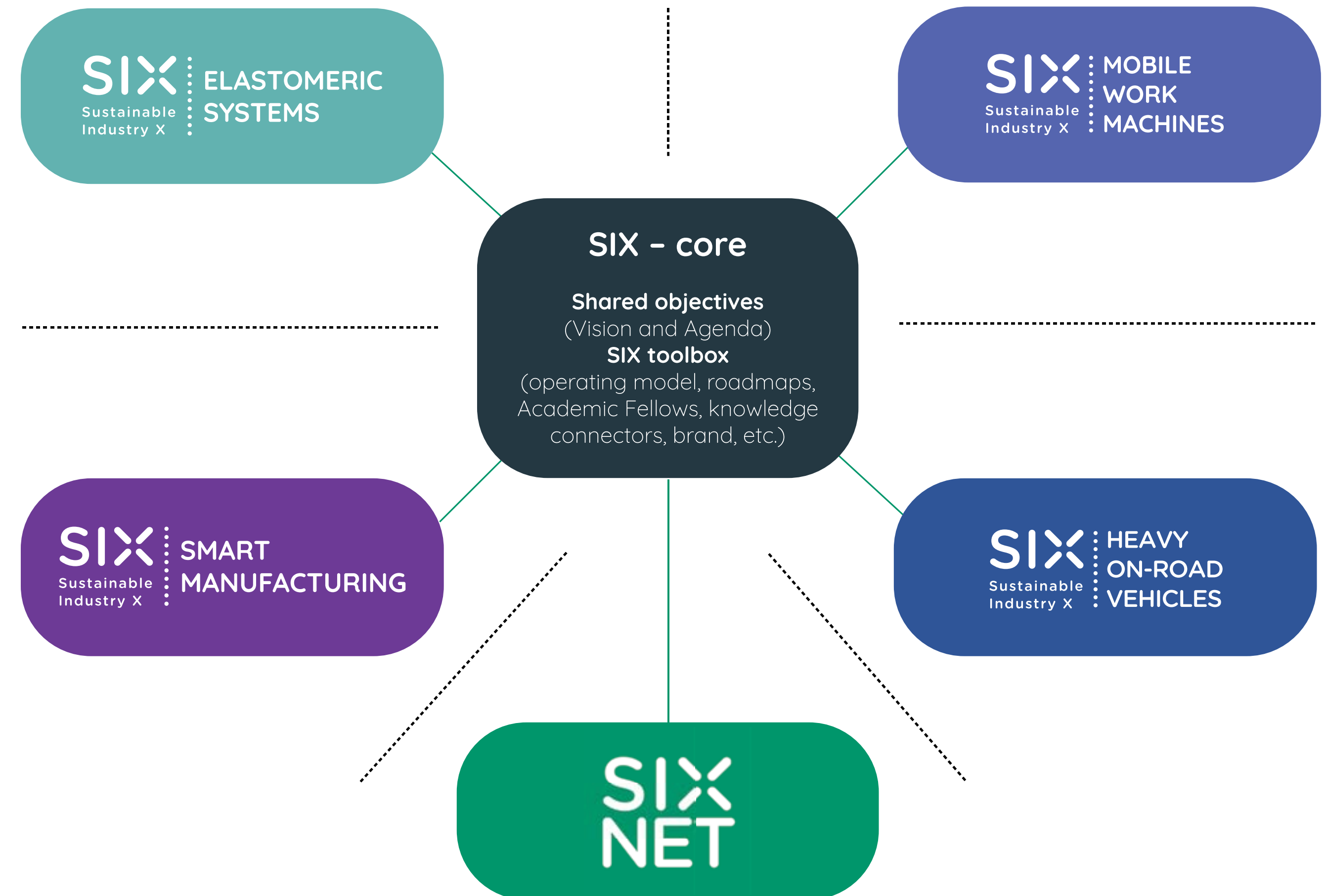


Figure 8. The current SIX 1.0 structure: clusters guided by a shared agenda, but operating in silos.

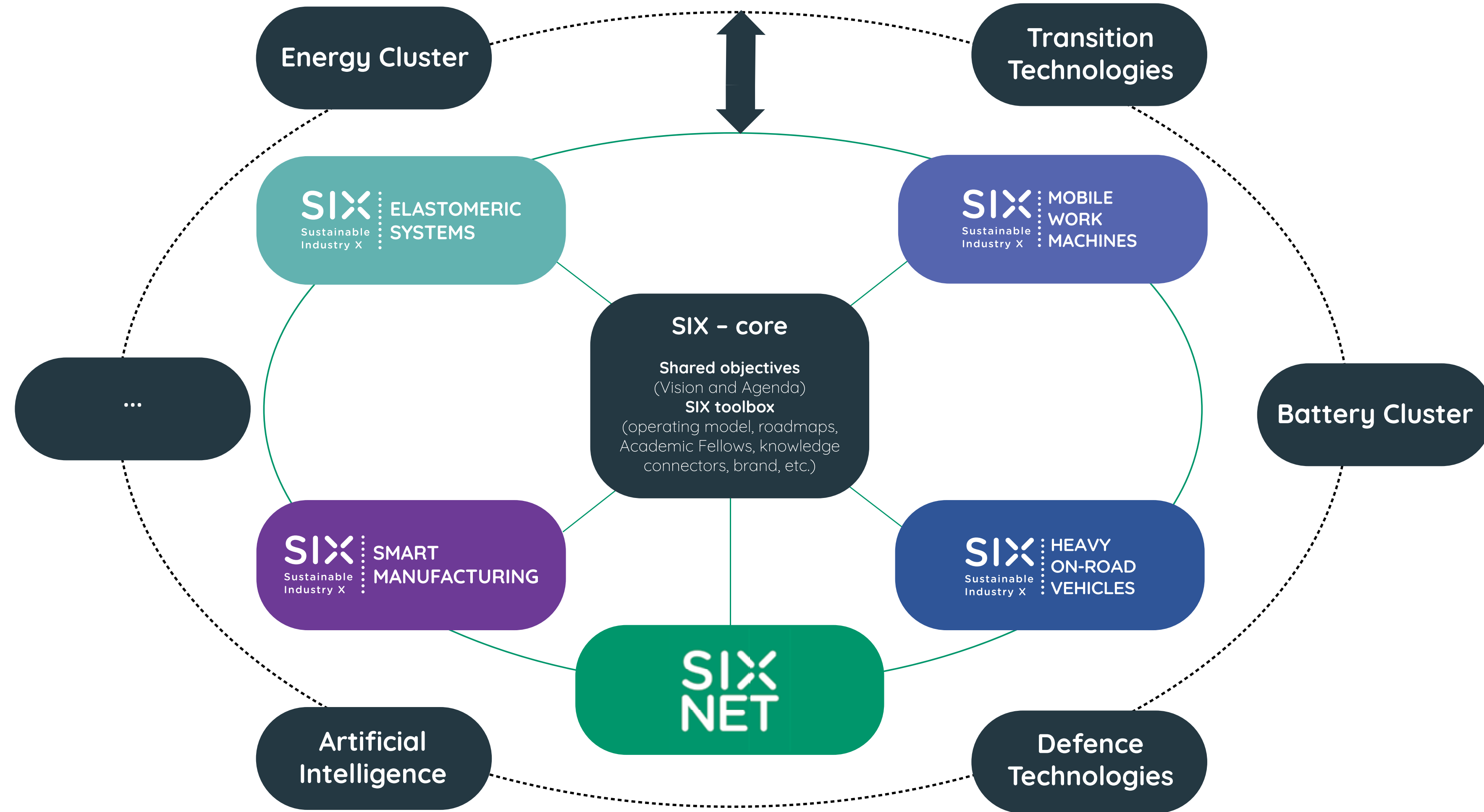


Figure 9. SIX 2.0, in which interaction is intentionally designed both between clusters and toward actors outside the SIX initiative (e.g. the Finnish Chips Competence Centre (FiCCC), the national battery cluster, AI Finland, the energy cluster, the defence sector).

To realize the potential at the interfaces and the idea of being “part of the same value network,” a shared focal point is needed. For such a focal point, it is essential to identify a sufficiently broad and naturally integrative domain that has significant growth potential of its own and a clear strategy for leveraging it.

Mobile work machines meet these criteria. Sandvik’s Jani Vilenius sees it this way: “SIX 2.0 is truly important. A good foundation has now been built, but continuous development and strengthening of cluster competitiveness are essential and unavoidable.”

Those deeply familiar with the development of the SIX initiative—Pauli Kuosmanen from Tampere University and Heini Wallander from Business Tampere—see many opportunities in the new phase, but also open questions.

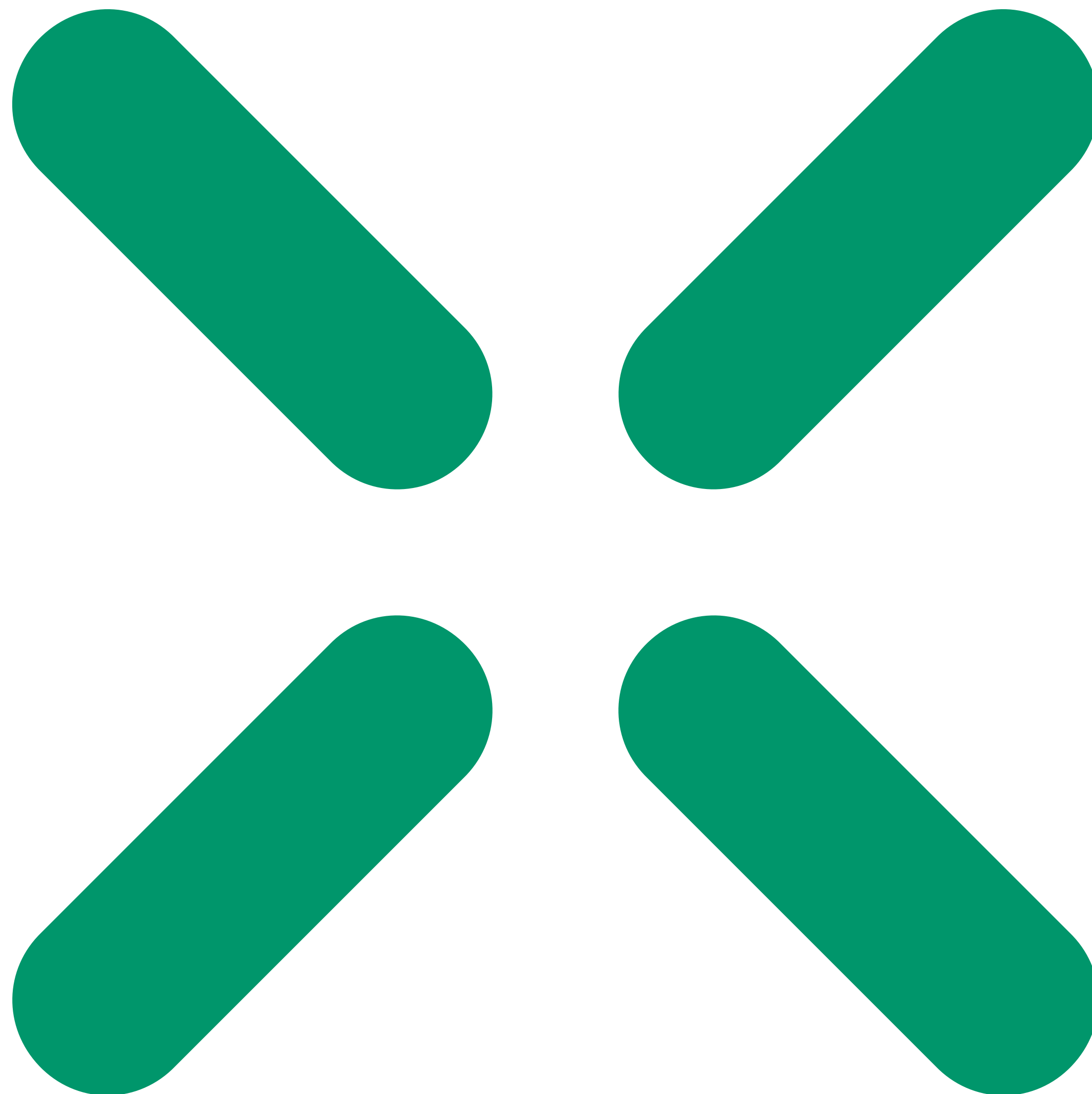
Finding solutions and managing risks require joint planning and agreement, just as six years ago. Kuosmanen reflects on the alternatives: “Two options: either we continue with the current model and allow the younger clusters to take off properly, or we push all the clusters currently operating in silos forward together, bring in spin-offs and AI, take a calculated risk, and give ourselves the chance to discover spillover effects. The key question for the success of change is how this will be resourced.”

Wallander largely agrees with Kuosmanen’s thinking: “Controlled opening of interfaces is needed. It is good not to close one’s eyes to developments outside the cluster.”

The Director of the Siruja Tampereelta program, Petri Räsänen, has followed the growth of the SIX initiative closely throughout its existence. He sees SIX 2.0 as offering many opportunities for new openings also around his own area of responsibility: “Who is the ‘Tesla’ of intelligent work machines—one that will transform the sector with its own disruptive solution and enable a new generation of electric work machines?”

With SIX 2.0, we stand at a new threshold, turning the page and beginning the writing of the next chapter of the SIX story. Only time will tell what this chapter will ultimately become. The journey, however, continues toward new opportunities—together, as we have done so far.





Part 2

Lessons and Insights from the Journey



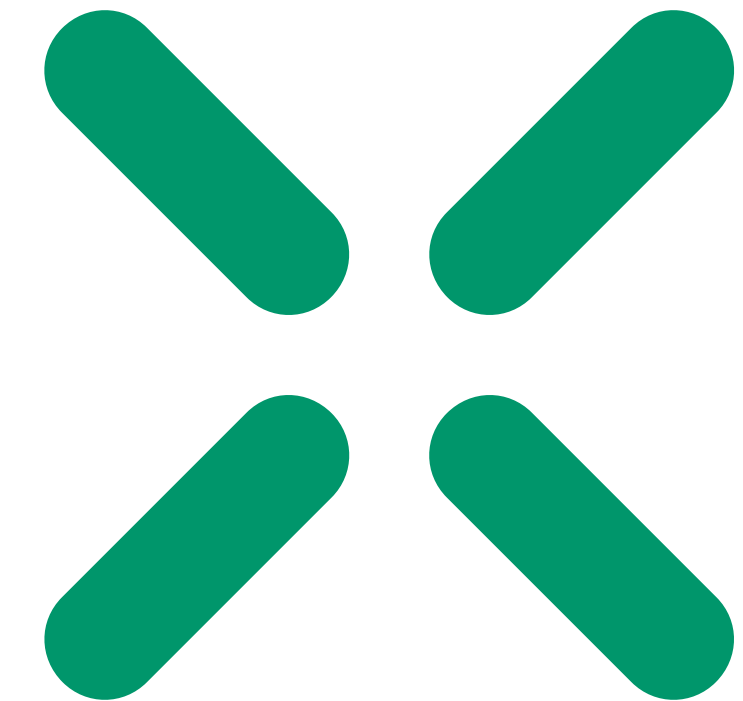
Orientation – Putting on the National Team Jersey

All major transformations begin with a vision and the courage to do things differently. When the Sustainable Industry X (SIX) initiative was launched in June 2020, it was underpinned by a strong—though still relatively compact—shared belief: Finnish industry can be among the world’s leaders in intelligence and sustainability, while remaining highly competitive. How our future takes shape is, ultimately, in our own hands.

The first five years have been an interesting journey, during which the operating environment, technology, and people have become increasingly intertwined. Companies, research organizations, and the public sector have together built a new kind of collaboration model—the SIX toolbox—developed through hands-on experimentation, continuous refinement, and, at times, necessary course corrections.

This short synthesis captures lessons and insights gathered along the way, and above all, reflections on how effective and impactful collaboration can be enabled.

Many of the practices we highlight are, in themselves, quite simple. But they are worth repeating, because repetition strengthens the opportunity to learn. The motivations behind these practices may be viewed differently—and that is entirely acceptable. If discussion is sparked, all the better. Constructive debate is essential. This is not a story about ready-made solutions, but about how change is built step by step. We hope these pages provide food for thought and ignite inspiration.



1. **A shared vision and agenda as the foundation** – an operational guiding thread to ensure common objectives and direction
2. **Systemic challenges require a systemic approach** – not traditional, fragmented project work, but goal-oriented continuums
3. **Leveraging existing strengths** – we are not starting from scratch; avoid wasting energy by creating new, overlapping structures
4. **Understanding the importance of shared responsibility** – you can only thrive if your environment thrives; developing the operating environment is a shared task
5. **Solutions fit for Finland – a combination of learning and realism** – learn from your own actions and from others; understand where influence is possible and where it is not
6. **Respect time as part of development work** – tact with sufficient long-term perspective; allow change the space to grow and take root
7. **Voluntary collaboration requires the ability to lead without authority** – understand actors' interests and motivations; create continuous value for participation
8. **Sharp focus in activities** – identify shared challenges and opportunities at a level where there is willingness to invest both time and money
9. **Only by doing do things happen** – commit all actors to action and excellence; understand roles; earn the mandate through action
10. **Visibility is a key part of impact** – good work does not exist if it is not visible
11. **People make the difference** – true impact is created through interaction

1. A Shared vision and agenda as the foundation



“Those who do not know the destination will never find the road.” Without a shared vision and agenda, each of us wanders in the dark toward goals we do not know. A common direction is not merely a strategic tool, but a foundation that brings the necessary actors together and provides direction for practical action.

When properly articulated, it creates—for people—a sense of meaning. When we share an understanding of where we are going and why, willingness and energy emerge to move forward together. Likewise, a vision and agenda that rise above individual operating environments and their natural focal points increase predictability in the operating environment. Predictability is crucial, for example, from the perspectives of industrial investments, long-term development, and building trust.

In practice, shared visions and agendas are often seen as abstract, top-down statements of objectives, while concrete implementation is left to others. This calls for dialogue and a complementary enabler of action: a sufficiently engaging and inspiring “top-down” direction (from administrative level downward) combined with a well-connected and practical “bottom-up” approach (from the field upward).

In implementation, no one can be forced to join at the macro level. No matter the direction, it is important to build frameworks within which participation is attractive, possible, and meaningful.

2. Systemic challenges require a systemic approach



The sustainability transition and climate change. Industrial renewal and the transformation of skills. Geopolitical uncertainty and resilience challenges. Many of today's major challenges share one defining feature: they are systemic. Broad, multidimensional, and deeply interconnected phenomena cannot be solved through a single action, sector, or line of thinking. They simultaneously affect society, the environment, the economy, and technology—requiring a systemic approach and multi-centered collaboration.

We live in a world of projects. Much of today's activity is characterized by project-driven, fragmented work. Projects come and go, but meaningful, large-scale impact rarely emerges—and when it does, it is often coincidental. To enable targeted impact, we must deliberately move from individual projects to goal-oriented development continuums that evolve over time and are built around shared objectives—seeing the forest, not just the trees. In this context, the shared agenda serves as a guiding thread.

On this basis, it becomes possible to build purposeful and impactful chains of activity that advance toward a common goal. This is also a key enabler for the next step of industrial research excellence.

In a systemic approach, it is essential to be able to see beyond one's own bubble. When addressing systemic challenges, impact does not emerge within silos, but above all at their interfaces—where new understanding and shared perspectives are created. In Finland, for example, there are numerous communities and networks with significant impact potential. However, too many of these remain, in practice, isolated pockets of activity without a clear link to shared objectives. Without a common direction and coordination, the whole fragments. Here we challenge ourselves to think differently. The renewal of industry and Finland's future success require a holistic approach, where objectives, resources, and action extend beyond organizational and sectoral boundaries.



3. Leveraging existing strenghts

There is no need to reinvent the wheel. Leveraging what already works enables faster progress and more impactful solutions. SIX is fundamentally built on this principle. Finland already has many strong building blocks in place: a stable political environment, a high level of education, well-functioning institutions, and a strong value base characterized by collaboration and trust. These are not self-evident strengths in today's world; on the contrary, they are key enablers for finding winning solutions together.

The SIX toolbox is largely built on existing strengths, with the aim of making what already exists more visible and usable at scale. It brings together plans, tools, operating models, and expertise into a coherent whole that can be used to achieve more. This is not accidental. Leveraging existing assets as a core operating principle increases speed and agility, and frees up energy and resources for advancing implementation. In other words, the starting point is not what we still lack, but how we can most effectively put to use what we already have.



4. Understanding the importance of shared responsibility

“Do not leave until tomorrow what you can do today.” This old saying is more relevant today than ever. In today’s world, postponing action is a choice that consumes the future. Conversely, the need to act extends ever further beyond one’s immediate environment—beyond one’s own domain, directly and immediately benefiting others as well.

Understanding shared responsibility means recognizing that no actor operates in a vacuum. Companies, research organizations, and other institutions can only thrive if their operating environment thrives as well. In a broader sense, this concerns the social, economic, and ecological operating environment; on a smaller scale, it relates, for example, to an industry and its internal dynamics.

Well-being is a shared matter, and sustainable growth cannot be built on the success of one at the expense of others. Shared responsibility is therefore not merely a moral principle—it is a strategic prerequisite for sustainable growth. It is an issue that every actor must be willing to look at honestly, starting by looking in the mirror.

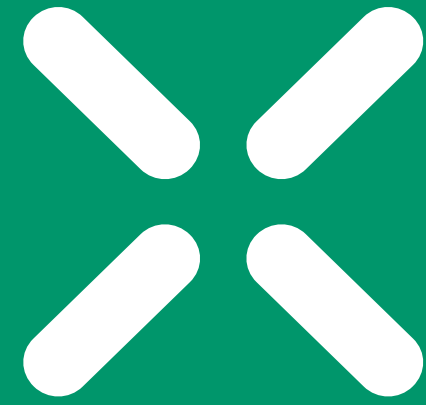
5. Solutions fit for Finland – A combination of learning and realism



All wisdom does not reside within us alone, so it is sensible to also draw on the wisdom of others—while still walking on our own feet. Over the past five years, solutions have been sought both domestically and internationally. We have not sought to copy models directly, but rather to learn from them and adapt them. Good operating models can be found in abundance globally, but identifying them together requires pausing to consider what is possible in our own operating environment and what is not—and, above all, what truly matters for achieving our objectives.

Solutions do not arise solely from new discoveries and insights, but also from past experience. Along the journey, we have systematically sought to leverage the tacit knowledge, practical experience, and contextual understanding accumulated by different actors.

A good practical example of this is the SIX Mobile Work Machines story. The history of the mobile work machine sector is long, and actors have been involved in numerous development phases in Finland and globally. Drawing on this experience in a deliberate and structured way has been valuable and has enabled impactful action from the outset. We know how things can be advanced, who does what and why. Correspondingly, we understand our operating logic and principles better—why things are done the way they are. This experience base is continuously applied in the operating environment of today and tomorrow. Along the implementation journey, lessons learned are used to make course corrections and support further development. Yesterday's operating models will not bring success tomorrow.



6. Respect time as part of development work

“We do miracles instantly; the impossible just takes a little longer.” We live in a moment-oriented economy, where, unfortunately, solutions that deliver immediate benefits and emphasize short-term cost efficiency are often valued over patience and long-term investment. However, impact that is linked to broad, sustainable growth does not emerge overnight. It is therefore essential to understand and respect time as an integral part of development work. This means not only broadening our perspective on objectives, but also forming a realistic understanding of the timeframe within which meaningful results can genuinely be achieved. Fast, agile experiments are a good way to move forward, but they are insufficient when it comes to systemic change that emerges from the combined effect of many different factors. Such change inevitably takes more time.

Within SIX, the aim has been to operate with a long-term perspective, giving change the space to grow and take root. This requires patience in many forms, but also the ability to read when impact is beginning to emerge. Often, the first signs of change are small and externally barely visible.

To ensure that invested effort does not fade away and that actions are directed correctly, early identification and visibility of these signals are crucial.

Likewise, the time required must be allowed to exist. This often means that sustainable action is not created or easily maintained externally. One of the foundations of sustainable activity is strong alignment with the shared interests of actors, combined with a way of working that is perceived as meaningful and adaptable to many different contexts.

Both in Finland and elsewhere, there are numerous examples of ecosystems whose emergence has been tied to a single project—the ecosystem itself becoming one of the project’s outcomes. These ecosystems often function only as long as external funding continues. When funding ends, activity gradually withers and opportunities for impact dry up completely. Water carried to a well does not stay there on its own.

7. Voluntary collaboration requires the ability to lead without authority



A defining characteristic of SIX is that it is not a top-down program, a funded project, or a single ecosystem. Above all, it is a broad initiative that combines different elements and is fundamentally based on voluntary (pro bono) engagement.

Actors are committed to development of their own free will, contributing their own resources and guiding their actions toward shared objectives. The scale of voluntary contribution in all development work has been significant, and it cannot be directly measured through project numbers or financial investments.

This chosen path has made organizing and leading the activities a unique challenge—and at the same time an excellent learning opportunity for everyone involved. Leading voluntary collaboration requires its own set of capabilities. Progress cannot be driven by authority or command; instead, it requires shared will, sensitivity to actor dynamics and motivations, and clarity around common goals.

Even though the work is long-term in nature, day-to-day execution must continuously deliver a promise of relevance, usefulness, and tangible outcomes. If this does not happen, people will vote with their feet.

Because there is no obligation to participate, every contributor must be genuinely engaged through inspiring content that connects to their own objectives. This requires listening, continuous dialogue, and the ability to repeatedly reshape activities so that they remain meaningful to participants. Motivating factors cannot be assumed—they must be discovered together.

Activities within SIX clusters, for example, have served as a learning environment for all participants also in softer forms of leadership and influence. Instead of rigid frameworks and strict governance, the focus has been on building a shared direction, enabling dialogue, and developing the sensitivity to recognize when it is time to move boldly forward—and when it is time to pause and listen.

8. Sharp focus in activities



When we try to pursue everything, we easily end up with fragmentation, diluted execution, and lukewarm outcomes. Choices must be made—and they require courage. Focus is often talked about, but too rarely practiced at the operational level. Ultimately, however, focus is a prerequisite for impact. Focusing does not mean narrow-mindedness; it means the ability to see essential connections and to prioritize the actions that truly matter.

Our principle of focus has been simple: concentrate on what is genuinely essential. Not on what merely sounds interesting, but on what is so important that the majority of actors are willing to invest their time, expertise, and resources in it. When this happens, practical action also gains momentum.

9. Only by doing do things happen

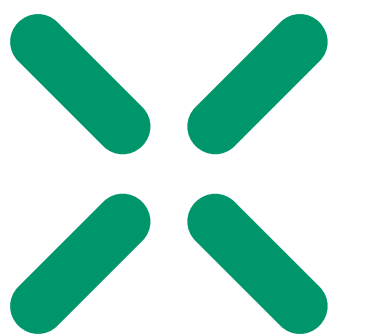
Miracles do not just happen—they are made. Action requires participation and the courage to move forward even amid uncertainty. To ensure progress, the principle applied has been active participation by every actor in joint implementation. This principle has sparked discussion—and some criticism—but it is well grounded. Sustainable collaboration does not emerge if some actors remain on the sidelines, engaging in armchair commentary and picking and choosing outcomes to serve their own purposes without contributing anything themselves. Uneven participation quickly erodes collective motivation and trust. SIX cluster activities are open to all welcome participants, but participation also means commitment and engagement at the practical level.

Before joining, three questions are therefore more important than formal registration or membership fees:

1. What is my own practical agenda—what do I want to achieve through this activity?
2. What do I bring to the shared table for others to benefit from?
3. What do I bring to the shared table for others to benefit from?

It is equally important to understand the roles and objectives of different actors within a multi-centered development context. Industrial-research collaboration in SIX clusters is a good example. Industrial renewal cannot happen through industry leadership alone, but neither can it be driven by research holding the reins. Industry brings use cases and an understanding of needs; research brings solutions for the future. This synergy requires that agendas, plans, and implementation are built inclusively, taking all actors' interests into account—even though industry ultimately sits in the driver's seat. The outcome is more than the sum of its parts.

Development initiatives too easily drift into endless coffee-table discussions and circular debates. Plans are extended so far into the future that, eventually, there is nothing left to plan. In SIX, the ambition has been to profile above all as a doer. When the direction is sufficiently clear, it is time to move. To ensure sufficient implementation capacity, all actors are given equal opportunity to take initiative. The goal is to activate shared objectives in multiple ways and to bring the necessary actors into their respective roles. Results emerge step by step—through experimentation, mistakes, course correction, and hands-on execution. At the same time, doers are also listeners. By listening, they earn their mandate and attract others around them—everything that achieving the objectives requires



10. Visibility is a key part of impact



It is unrealistic to expect results from actors who do not know what is being done. Likewise, we cannot speak of impact if activities and outcomes are not visible in any way within the operating environment. Impact does not arise from substance alone—it also requires being made visible.

Within SIX, communication and the promotion of visibility are not support functions, but an integral part of the work itself. Tools, agendas, objectives, actions, and results are brought to the fore as clearly, timely, and openly as possible. This model is part of advancing SIX's impact objectives, but at the same time it is good practice in its own right. When everyone understands what is being done and why, it becomes possible to participate, further develop, build on, support, and challenge the work. All of this, in turn, enables learning, collaboration, and a shared direction.

11. People make the difference



Have you ever made a decision based purely on a spreadsheet? Or seen a company make a decision solely on that basis? If you think about it a little longer, the answer is most likely no—behind every decision, there is always a human being. As humans, we never act purely rationally, but based on our values, experiences, and human perspectives. Ultimately, decisions, direction, and results are created through human action. This is something that must be taken seriously when aiming to achieve something truly meaningful.

The activities of SIX and its ability to deliver results are therefore connected not so much to organizations, but very directly to people and their interactions. Innovation and business leadership literature, as well as startup investors, emphasize the same point: a cohesive, sufficiently capable, and committed team is the most important factor for success. Yet when designing collaboration patterns, attention is often focused primarily on organizations and formal structures, without sufficiently considering how motivated and capable the people doing the practical work actually are.

This can lead to thin results. We have sought to operate differently. For example, people have been brought together in clusters who share a clear common objective, strong will, and the opportunity to work toward it—but also to involve their broader environments in the work.

Finland is a small country, in many ways like a club. In such an environment, soft talk and evasive decision-making do not carry far. We succeed through directness, honesty, and openness. At the same time, all the required expertise is not found in one place—networking must be both national and international. Whether we are in Finland or elsewhere, impact is not built through cold fact sheets. Impact is created through genuine interaction between people. Through the ability to communicate and understand one another—even when perspectives differ significantly. Through the ability to put oneself in another's position and to understand different ways of thinking. In our work, this means paying close attention to who is doing the work, why they are doing it, and how they succeed—not just to what is being done or which governance models are applied.

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The authors would like to extend special thanks to Miika Kaski (Sandvik). He has been a key contributor throughout the journey of this publication, from idea to implementation.

J. Paasi, H. Nieminen (2026)

System of Impact: The SIX Story from Joint Vision to World-Class Execution

Graphic design: N. Alanen (Tuotekehitys Oy Tamlink)

ISBN 978-952-88-2478-7 (soft cover)

ISBN 978-952-88-2479-4 (PDF)

Tamlink Ltd., 2026

www.tamlink.fi

