SPARK research and education environment

1 SPARK

SPARK was formed in 2017 and is a research and education environment at the School of Engineering, Jönköping University (JU) focusing on *knowledge intensive product realization*. The motivation behind forming SPARK was to combine the vision, strategies, and existing competencies at JU with industrial needs to improve development capabilities in knowledge intensive products and processes to better compete in a challenging business environment.

The vision of SPARK is to establish a "*nationally leading and internationally competitive research and education environment within knowledge intensive product realisation."*

The key term knowledge-intensive refers to all activities of this process, as well as properties of the developed products and services. Consequently, SPARK emphasizes both the high level of knowledge required within industrial product realization in modern products and service design as well as the necessary methods and technologies for realizing sustainable smart products and services as depicted in ***Figure 1***.

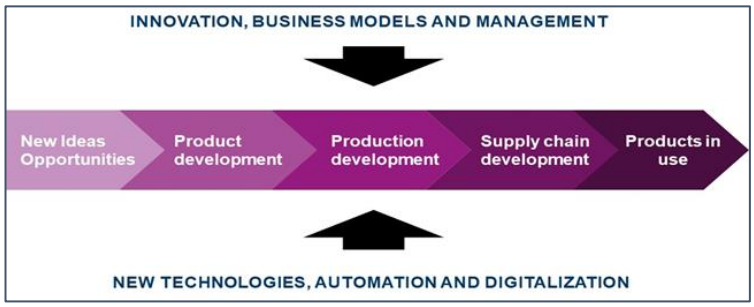

Figure 1. *Illustration of the various scientific fields and aspects as an integral part of knowledge intensive*

To further focus SPARK strategic development towards the vision, three distinct sub-environments that set the profile direction of SPARK within *knowledge intensive product realization* have been established. The three selected sub-environments are.

in:sure - Integrated Product and Production Development for Sustainability and Resilience

- Supporting the transition towards a sustainable and fully integrated product and production development process supporting resilience and circularity in future products and manufacturing systems.

Sustainable Materials, Manufacturing, and Cast Components

- An internationally recognized environment that research on advanced materials used in advanced manufacturing processes to reach optimized components; the three distinct pillars that are the core of sustainable product realisation in the manufacturing industry.

Human-Centered Industrial AI

- A multi-disciplinary environment with focus on the application of applied AI to support responsiveness of organizations, in terms of both supply and demand.

The three sub-environments reflect the needs of the manufacturing industry, as well as ongoing strategic investments and larger environmental building research projects, which JU, Knowledge foundation and the industry have supported and financed.

2 SPARK, AMBITIONS AND STRATEGY

Five main strategic areas - Impact, Research, Co-production, Education, and Management & Support processes - have been defined to support the development of SPARK. Each strategic area has formulated ambitions and strategies, in summary below.

Impact: With the scope to maintain and improve the quality of life, development of research applications with industrial and strategic partners that contribute to a sustainable societal development, and embedment of research in collaboration in educational programs.

Research: SPARK focuses on increasing its bibliometric index by increasing the number of scientific publications in highly ranked journals. Increased internationalization by recruitment of international competence is important to strengthen the research, to complement existing competencies, and to improve networks outside of Sweden.

Co-production: Co-production with strategic industrial partners will be strengthened by broadening the integration and engagement, and by offering cross-over positions that enable closer collaboration on different levels.

Education: Based on the alignment analysis performed within the School of Engineering, new master's programs and life-long learning possibilities will be implemented. Competence development courses will be made available to industry.

Management and support processes: Strategic national and international academic alliances are being defined/identified. European and other international universities with good student exchange are being identified to develop closer research links to and build strategical alliances with and consequently be integrated into more EU funded projects. Together with identified EU-partners, SPARK aims to identify a unique research and educational offer and henceforward build a cluster and initiate and establish a European university partnership through the European University Initiative framework.

3 SPARK, MAIN RESULTS FROM THE PAST YEARS

SPARK has grown with an increased project portfolio/funding as well as with an increased number of researchers that have been recruited to the environment. Since 2017 three sub-environments have been developed relevant to *knowledge intensive product realization* and based on industrial needs, with the purpose of profiling the research and education in SPARK.

The in-kind funding and the number of companies involved in SPARK have also increased. ***See Table 1.***

Total number of researchers	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Number of researchers	89	97	100	102	111	116
FTE	72	88	89	85	92	97
Number of PhD students	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
PhD students	44	40	44	39	44	37
FTE	28	25	29	22	26	20
Number of international guest professors	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Guest professor	2	2	3,6	4,4	1,92	3,5
FTE	0,2	0,2	0,6	0,6	0,28	0,6
Number of scientific publications	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Articles in journals	95	109	108	88	105	80
Percentage of WoS indexed articles			*82%*	*80%*	*90%*	*94%*
Conference papers	101	98	87	66	60	111
Total	**196**	**207**	**195**	**154**	**165**	**191**
Indirect funding (in-kind) from partners	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Number of involved companies	81	89	93	84	90	85
Indirect funding [MSEK] - KK funded projects	30	37	40	25	32	26
Indirect funding [MSEK] - Other funding agencies - manily Vinnova					7	8
Number of professors	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Number of professors	16	17	18	17	16,4	16,4
Research	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Bibliometriskt index (Colliander JTH)	36	57,2	63,4	76,4	99,5	108,7
Education	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Number of new / updated educational programs	2	3	1	6	6	3
Developed courses for working professionals (HE credits)	7	8	13	16	20	26
Developed seminar / webinar for working professionals					25	12
Research funding	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Total reserach funding (external, internal) [MSEK] (JTH)	81	91	103	100	101	106
Total external funding [MSEK] (JTH)	49	53	66	61	64	63

Table 1. *SPARK Key Performance Indicators*