10 years as Knowledge and Competence Centre

Evaluation of the development of three Knowledge and Competence Centres

Mid Sweden University TransTech
University of Skövde INFINIT
Halmstad University Research for Innovation

The Knowledge Foundation
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The findings and opinions contained
in the evaluation are solely those of
DAMVAD Analytics.

For more information

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The Knowledge Foundation initiated the program Knowledge and Competence Centres with the objective to support Swedish universities in developing strong research and education environments in strategically selected and profiled areas. The program is intended to support academic leaders by providing a ten-year financial framework agreement, offering an opportunity to strategically select and use various measures in building strong and integrated research and educational environments.

Long term strategic development requires high level of engagement, and therefore the program aims at providing support in profiled areas selected by the university, which is key in driving its strategic development.

A developed Knowledge and Competence Centre should be characterized by:

- Clear leadership and management structures, both at an overarching university level as well as within the specific environment.
- Development according to a clear strategic plan based on each universities’ prerequisites.
- Well-functioning collaboration and co-production with profiled and strategically selected external academic and business partners.
- Well-functioning processes for internal management of resources and mandates.
- A well-developed quality assurance system that supports strategic development together with business partners, assure the quality of all selected initiatives through external scientific expertise, and provides systematic monitoring in relation to strategy.
- Scientific quality that is strengthened in selected profiled areas.
- Integrated research and education environments where research and education are performed in clear collaboration.
- Research and education at an advanced level are conducted in co-production with business partners.
Preface

During the last 20 years, there has been a requirement for higher education institutions to design strategies for both research and education, as well as a requirement for increased profiling. However, the governmental system for financing research and higher education has not supported this. The program Knowledge and Competence Centres provided by the Knowledge Foundation aims at providing a solution to the requirement of stronger strategic and profiled universities.

This is the first evaluation of the three Knowledge and Competence Centres that have been operating in the program for 10 years. The evaluation was carried out by DAMVAD Analytics on behalf of The Knowledge Foundation.

We would like to thank everyone who has participated in this evaluation during 2020 and 2021.

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1. Introduction

This report contains the results of the evaluation of the Knowledge and Competence Centre programme (KK-miljöprogrammet) and the 10-year development journey of the three Knowledge and Competence Centres (KK-miljöer) at Halmstad University (Research for Innovation), Mid Sweden University (TransTech) and the University of Skövde (INFINIT) from 2010-2020.

The objective of the Knowledge and Competence Centre programme is to support the strategic development and profiling of higher education institutions. The higher education institutions that implement the programme should strengthen their profiling and develop complete academic environments with increased scientific impact and a strong co-production ability. The programme is truly unique in both a national and international context. Especially with its strong focus on strengthening universities’ strategic and organisational abilities, and with its ambition to build complete higher education environments balancing and integrating research and education in collaboration with industry.

A multitude of methods have been applied in the evaluation, including quantitative data analysis, interviews, questionnaire surveys, document studies, workshops, and bibliometric analysis. The evaluation was conducted from May 2020 to March 2021. The evaluation has involved a continuous engagement of more than 100 representatives connected to the three Knowledge and Competence Centres, as well as experts and representatives from industry. It has all been made possible through the very active and positive participation of the three Knowledge and Competence Centres, their host universities and the Swedish Knowledge Foundation.

The purpose of the evaluation is threefold: 1) to provide insight into the goal fulfilment of the Knowledge and Competence Centre programme, including the effectiveness of its implementation; 2) to analyse the 10-year development journey of the three Knowledge and Competence Centres; and 3) to deliver recommendations for the possible adaptation and amendment for further development of the programme. The evaluation analyses the extent to which the programme has contributed towards strengthening the strategic and organisational ability of the Knowledge and Competence Centre and their host universities; creating a well-functioning quality assurance system; strengthening the academic profiling ability; developing a better balance and integration between research and education; improving the ability in securing resources; and to cooperate with companies and other external stakeholders.
2. Executive Summary – Overall impression

The Knowledge and Competence Centre programme has within the period evaluated (2010-2020) brought more than 240 industry partners together in around 200 projects. In total; 191 doctoral degrees, 120 licentiate degrees, and 610 masters degrees have been awarded in connection to the three Knowledge and Competence Centres. The research produced in the three Knowledge and Competence Centres has generally been of high quality. Over the 10 year period a total of 3,491 peer-reviewed publications have been published, of which 1,931 have been co-published with researchers from 76 different countries.

There is high overall satisfaction with the programme among central participants in all of the three centres. Nearly 90 pct. of the central participants answered in a questionnaire survey that their respective Knowledge and Competence Centre has been a success. The impression across all the evaluation results is that the programme has performed well with respect to strengthening centres and their host universities on the central parameters, including strengthening their strategic and organisational ability, quality assurance, academic profiling, balancing research and education, and collaboration with external partners. The biggest impact from the programme has been on the strategic and organisational abilities, which has clearly been strengthened at the three universities.

However, the evaluation also shows that it has been quite a big mouthful for all three centres and their host universities to engage in such a fundamental transformation following the ambitious objectives of the programme. This explains the slow progress of the centres in the first half of the period. It has required fundamental changes not just in strategies, management structures and processes but in the mindset and culture. It has required big shifts from an individualistic to a collective approach, from a simple and siloed focus on research or education to a holistic focus on balancing and integrating research and education. All easier said and planned than done. That is what this analysis of the development of the three centres over a 10-year period will show in detail, describing the 10 year development journey of the three centres.

Finally, it is clear that the results also have implications for a broad support measure like the Knowledge and Competence Centre programme. The evaluation has identified several factors that challenge the programme’s effectiveness and goal attainment. On this basis specific changes are suggested for the programme. In the following we summarise all results linked to the key questions of the evaluation.
Executive Summary – Strategic and organisational abilities

All three Knowledge and Competence Centres and their host universities have taken major steps over the 10-year period when it comes to strengthening their strategic and organisational abilities. Progress, however, has been delayed in the first years by the fact that the universities initially did not acknowledge the broader objectives and full potential of the Knowledge and Competence Centre programme as a tool for long-term structured development and profiling.

The three centres and their host universities have developed from rather different levels of strategic readiness and therefore also with rather different approaches to the journey ahead. The Knowledge and Competence Centre programme has proven particularly effective when university management has used it as a strategic tool to transform elements of the university.

**INFINIT's and TransTech's** goals and strategies where quite unclear from the start. However, in the last years the two Knowledge and Competence Centres have found a more strategic approach towards their surroundings and other actors. In both places the culture has changed in the whole organisation to become more cooperative and collective, understanding own strengths and their competitive environments.

The transformation and achievements are probably biggest at TransTech, which during the 10 year period has turned into a more profiled and complete academic environment in its own right and with more equal collaboration with industry.

Halmstad University had from the onset rather clear goals and strategies for what to achieve with the development of its Centre 'Research for Innovation' (FFI). Halmstad University and the University of Skövde are both smaller university, and the Knowledge and Competence Centres make up a relatively large proportion of the universities. In contrast to INFINIT and the University of Skövde, the goals of FFI have all along been more in line with the university's goals. Halmstad University and FFI also have a stronger monitoring of its surroundings and own achievements.

The organisation and management of the three Knowledge and Competence Centres have also developed quite differently. FFI and TransTech have both developed strong organisations with clear purposes, governance structures and leadership. The organisational changes at INFINIT have been more limited, and the Knowledge and Competence Centre here is the one that still looks most like a classic university.
Executive Summary – Strengthening quality assurance

The three Knowledge and Competence Centres have all worked with establishing new methods, working processes and systems of quality assurance. The quality assurance systems implemented have mainly focused on assuring the quality of applications to the Knowledge Foundation.

At the University of Skövde, the quality assurance system has been adopted by the entire university. This has not happened to the same extent at Halmstad University and Mid Sweden University. The quality assurance systems implemented at INFINIT and the University of Skövde is seemingly the broadest in terms of focus (review of applications, including projects and collaborations) and organisation and implementation. It has seemingly had an effect on INFINIT’s ability to attract funding from the Knowledge Foundation.

FFI at Halmstad University has also seen a large effect in respect to funding from applying a quality assurance system, as it has increased its ability to attract a larger and broader funding base. At Halmstad University, the Knowledge and Competence Centre has had a significant impact on the attitudes towards how research proposals are assessed. The quality assurance system has facilitated external and more independent reviews of the research through expert groups involved in assessing proposed projects. However, it is not been implemented at the university as a whole.

At Mid Sweden University, the quality system has definitely affected the working methods and processes within the NMT faculty. It has changed the strategical mindset of the faculty by inviting researchers to look beyond their specific projects and work towards a common goal.

The implementation of quality assurance systems has clearly impacted the attitudes and the working cultures in all three Knowledge and Competence Centres as well as in their host universities to smaller or larger extent.

Researchers in all three Knowledge and Competence Centre’s state, that they have seen a development in the way researchers see possible projects as a possibility to build up the centre rather than just focusing on individual projects, as used to be the case. A more collective and cooperative approach to research and writing applications and a common understanding of own research strengths and outside competition and possibilities have developed.
Executive Summary – Securing access to financing and skills

All three Knowledge and Competence Centres have struggled to increase and secure their access to financing and skills over the 10-year period, some with more success than others.

TransTech and FFI have both managed to attract substantial new funding over the period. FFI has been particularly successful in attracting external public funding, clearly indicated by a rise in public funding by 253 pct. between 2014 and 2019. TransTech has seen a similar though not as big increase of 44 pct. in funding from public financiers. A large share, some 80 pct. of the public funding, comes from EU-regional funds.

Continued and stable funding from the Knowledge Foundation has been very important for all three centres during the whole period. At its highest, the Knowledge Foundation contributed to more than 30 pct. of the funding to all three centres. While Knowledge Foundation funding has decreased for FFI and TransTech towards the end of the period, the importance of Knowledge Foundation funding has increased for INFINIT throughout the entire period and reached 38 pct. of total funding in 2019.

For all three Knowledge and Competence Centres, grants from the host university have been the most important source of funding for the entire period. This type of funding has increased for all three centres.

In terms of recruiting and securing access to skills, the three centres have over all experienced a positive effect from the Knowledge and Competence Centre programme. All three Knowledge and Competence Centres have thus grown in size over the 10-year period. While TransTech and FFI have had a stable growth in FTEs in research over the period, INFINIT’s growth pattern has fluctuated more over the 10-year period, following also the narrowing of the centre’s scope and the aim to strengthen its profile towards the end of the period.

It is fair to say that all three Knowledge and Competence Centres have met challenges in recruiting researchers in their competitive research fields. INFINIT has struggled the most with recruiting and retaining scientific personnel but TransTech has also met challenges recruiting in one of their sub-centres. For FFI, the recruiting challenge has not been as tough as for the two others, and it has differed depending on sub-centres and position.
Executive Summary – Strengthening academic profiling

An important objective of the Knowledge and Competence Centre programme is to support the strengthening of the Knowledge and Competence Centres' profiling abilities, which means that the centres should be able to define their scientific profile areas and strategically develop these so that the centre nationally and internationally reaches scientific recognition and constitutes an attractive partner in a well-developed academic network. This in turn should impact the profiling of the host university. All three centres have struggled to identify and achieve a clear strategic profiling in the intersection of the participating sub-environments. The programme is seen as an important profiling tool and academic profiling has been a key issue in the discussions between the centres, the expert group and the Knowledge Foundation during the entire period. The management and researchers at all three centres argue that their profiling abilities have been strengthened and specialisation has increased as a result of the programme. This is indicated by a substantial increase in publications in the centres’ targeted research areas.

For TransTech, the formulation of a so-called TIE vision in 2015 was perceived as critical for the profiling of the centre. Before 2015, the centre developed without a common theme and goal and the centre was not internally perceived as a unit. The centre received its name as late as 2016 and the name is still not used extensively in external communication, as the FSCN and STC brands are still believed to have strong bonds with external partners.

While the development of INFINIT has contributed to a stronger profiling of the University of Skövde, it has been a challenging process to develop a coherent research centre within INFINIT. While the starting point seemed rather clear with three sub-centres which shared the IT-base, the overall centre has struggled to define its core and to set a clear direction. The last 3-4 years INFINIT has made a lot of progress in narrowing its scope and strengthening the academic profile of the centre. As a result the centre has become smaller.

From the onset FFI was perceived by the management as a tool to continue an already ongoing strategic plan to profile Halmstad University towards innovation and entrepreneurship. In that Halmstad University has succeeded. However, the first years were challenging as it proved difficult to really strengthen the integration between research subjects and to balance and integrate research and education. However, since 2015 several important actions have been taken, which has really contributed to strengthen the profiling of FFI by scientific integration and integrating research and education.
Executive Summary – Balancing and integrating research and education

The balancing and integration of research and education, and thereby the aim to build complete environments is an important objective of the Knowledge and Competence Centre programme. However, the evaluation of the implementation of the programme shows that this objective was only really given high priority by the Knowledge Foundation and the universities in the last half of the period from approximately 2015 and onwards. Since 2015, however, remarkable results have been achieved at all three universities.

**FFI at Halmstad University** is the centre that has given the research–education balance most attention. A lot has been done to create a better balance between research and education. Halmstad University has used the Knowledge and Competence Centre programme as a tool to increase the interaction between research and education through the development of "complete chains" of education as well as the integration of research into education. An important development at Halmstad University is also the consolidation of education programmes and increased requirements on academic merits for education leaders at the university.

At both **INFINIT** and **TransTech** little attention was given to balancing and integrating education and research until 2015. The last years **INFINIT** has developed advanced level educational programmes that are closely related to the research priorities at INFINIT. However, it has been challenging to obtain a substantial student volume in these programmes, indicating that there is no quick fix to goal attainment on the objective. Since 2017 the reviewing of applications has included ensuring that the projects contribute to the balance between research and education which the actors are more aware of than before.

At **TransTech**, the two research centres FSCN and STC have historically been very different in terms of their balance between research and education. It was a big change when the university decided that it should no longer start new educational programmes unless the university has research within the programme’s particular area. As of 2020, all but one of the civil engineering programmes are related to the Knowledge and Competence Centre. Going from being identified as a research institute to focus more on education generated a lot of stress within the FSCN research centre, according to the interviews and workshop perspectives. The process of integrating education and research has generally been described as a big but successful change in the work culture.
Executive Summary - Collaboration with external partners

The three Knowledge and Competence Centres and their host universities come from rather different starting positions when it comes to collaboration with external partners. While Mid Sweden University and the University of Skövde both have long traditions of cooperating with industry, FFI at Halmstad University was not based on any strong linkages with external partners. Yet, substantial changes have taken place in all three centres in regard to external collaboration as a result of the programme.

Researchers at Halmstad University traditionally looked at industry collaboration in a somewhat constraining local context and they struggled to find their roles and seeing the benefits of collaboration with industry. The development of the Knowledge and Competence Centre entailed big changes in researchers’ opinions and most of the initially critical researchers now see the value of co-production with external actors. The Knowledge and Competence Centre programme has even influenced the development of a future strategy including continuing already initiated collaborations instead of ending them after the project is finalised. Another ambition is to work with a more national and international approach, strengthening collaboration with partners outside the local contact.

TransTech’s collaboration with industry had until 2014 mostly focused on the already existing long-term relationships with big forest industry companies. A new strategy for industry collaboration started forming in 2014. The new strategy defined two different types of industry partners: 1) Core – industry fundamental companies focusing on resource efficiency and 2) Edge – new businesses. Historically, FSCN had been working with Core companies while STC, being centred around IT, had been more involved with Edge companies. By integrating the profiles, launching a new vision (TIE vision) and defining companies as Core or Edge, the new strategy for industry collaboration was another step towards bringing the centre together around a common theme.

INFINIT has experienced a continued positive development when it comes to collaborating with external partners. INFINIT has over the 10 year period managed to establish many new partnerships with industry and the public sector, and researchers find the industry collaborations some of the most meaningful parts of their research. However, it is still primarily the individual researchers who hold the connections to the collaboration partners. It is also clear that the industry partners here are less aware that they are working with INFINIT or what this research centre really encompasses.
3. Svensk sammanfattning - Introduktion

Denna rapport innehåller resultaten från utvärderingen av KK-miljöprogrammet och den 10-åriga utvecklingsresan för de tre KK-miljöerna vid Högskolan i Halmstad (Forskning för Innovation), Högskolan i Skövde (INFINIT) och Mittuniversitetet (TransTech) mellan 2010-2020.

Målet med KK-miljöprogrammet är att stödja strategisk utveckling och profilering av lärosäten. Syftet med programmet är att lärosätet ska stärka sin övergripande profilering och utveckla kompletta akademiska miljöer med ökad vetenskaplig genomslagskraft och stark samproduktionsförmåga. Programmet är unikt både i nationell och internationell kontext. Inte minst genom ett tydligt fokus på att stärka lärosätens strategiska och organisatoriska förmågor med ambition att bygga kompletta akademiska miljöer som balanserar och integrerar forskning och utbildning i samverkan med näringslivet.


Syftet med utvärderingen är tredelad: 1) fördjupad förståelse om måluppfyllelsen för KK-miljöprogrammet, däribland hur effektivt det implementerats av KK-stiftelsen; 2) analysera de tre KK-miljöernas 10-åriga utvecklingsresa; och 3) komma med rekommendationer av möjliga anpassningar och ändringar för fortsatt utveckling av programmet. Utvärderingen analyserar i vilken grad programmet har bidragit till att stärka strategisk och organisatorisk förmåga vid KK-miljöerna och lärosätena; skapat ett välfungerande kvalitetssäkringssystem; stärkt den akademiska profileringen; utvecklat en bättre balans och integration mellan forskning och utbildning; förbättrar förmågan att säkra resurser; och samverka med företag och andra externa intressenter.
Sammanfattning – Övergripande intryck


Överlag råder det hög tillfredsställelse med programmet bland de centrala deltagarna i samtliga tre KK-miljöer. Nästan 90 procent av de centrala deltagarna har i en enkät angett att de anser att den KK-miljö de arbetat i har varit framgångsrik. Intrylet i alla utvärderingsresultaten är att programmet har presterat bra med avseende på att stärka miljöerna och deras vårduniversitet på de centrala parametrarna, inklusive att stärka deras strategiska och organisatoriska förmåga, kvalitetssäkring, akademisk profilering, balansera forskning och utbildning och samarbete med externa partners. Programmets största inverkan har varit på de strategiska och organisatoriska förmågorna, vilka tydligt har stärkts vid de tre lärosättena.

Utvärderingen visar dock även att det har varit en relativt stor utmaning för samtliga tre KK-miljöer och respektive lärosäte att delta i en sådan grundläggande omvandling efter programmets ambitiösa mål. Detta förklarar KK-miljöernas långsamma framsteg under periodens första hälft. Det har krävt grundläggande förändringar inte bara i strategier, ledningsstrukturer och processer utan även i tankesätt och kultur.


Sammanfattning – Strategiska och organisatoriska förmågor

Alla tre KK-miljöer och respektive lärosäte har tagit stora steg under tioårsperioden när det gäller att stärka deras strategiska och organisatoriska förmågor. Framstegen har emellertid försenats de första åren av det faktum att universiteten ursprungligen inte erkände de bredare målen och den fulla potentialen i KK-miljöprogrammet som ett verktyg för långsiktig strukturerad utveckling och profilering.

De tre KK-miljöer och respektive lärosäte har utvecklats från förhållandevis olika nivåer av strategisk beredskap och därför också med relativt olika synsätt på resan framåt. KK-miljöprogrammet har visat sig vara särskilt effektivt när lärosätesledningen har använt det som ett strategiskt verktyg för att omvandla delar av universitetet.


Transformationen och prestationerna är troligen störst vid TransTech, som under tioårsperioden har utvecklats till en mer profilerad och komplett akademisk miljö i sin egen rätt och med industrisamverkan på lika villkor.

Högskolan i Halmstad hade från början relativt tydliga mål och strategier för vad som skulle uppnås med utvecklingen av sin miljö **Research for Innovation (FFI)**. Högskolan i Halmstad och Högskolan i Skövde är båda mindre lärosäten där respektive KK-miljö utgör en relativt stor andel av lärosätena. Till skillnad från INFINIT och Högskolan i Skövde har målen för FFI hela tiden varit mer i linje med lärosätets mål. Vidare har Högskolan i Halmstad och FFI i högre grad följt upp och analyserat sin omgivning och egna prestationer.

Organisationen och ledningen av de tre KK-miljöerna har även de utvecklats olika. FFI och TransTech har båda utvecklat starka organisationer med tydliga syften, styrningsstrukturer och ledarskap. De organisatoriska förändringarna vid INFINIT har varit mer begränsade och är den miljö som fortfarande påminner mest om ett klassiskt lärosäte.
Sammanfattning – Stärkt kvalitetssäkring

De tre KK-miljöer har alla arbetat med att skapa nya metoder, arbetsprocesser och system för kvalitetssäkring. De implementerade kvalitetssäkringssystemen har huvudsakligen fokuserat på att säkerställa kvaliteten på forskningsansökan till KK-stiftelsen.


FFI vid **Högskolan i Halmstad** har också sett en stor effekt när det gäller finansiering genom att använda ett kvalitetssäkringssystem, eftersom det har ökat förmågan att attrahera en större och bredare finansieringsbas. Vid Högskolan i Halmstad har KK-miljön haft stor inverkan på inställningen till hur forskningsansökningar värderas internt. Kvalitetssäkringssystemet har underlättat för externa och mer oberoende granskningar av forskningen genom expertgrupper som är involverade i bedömningen av föreslagna projekt.

Det har dock ännu inte implementerats vid hela lärosätet.

Vid **Mittuniversitetet** har kvalitetssystemet definitivt påverkat arbetsmetoderna och processerna inom NMT-fakulteten. Det har förändrat fakultetens strategiska inställning genom att bjuda in forskare att se bortom sina specifika projekt och arbeta för ett gemensamt mål.

Implementeringen av kvalitetssäkringssystem har tydligt påverkat inställningen och arbetskulturerna vid samtliga tre KK-miljöer samt respektive lärosäte i större eller mindre utsträckning.

Forskare vid alla tre KK-miljöer säger att de har sett en utveckling i hur man ser projekt som en möjlighet att bygga upp miljön snarare än att enbart fokusera på enskilda projekt, som tidigare. Ett mer kollektivt och samarbetsvilligt förhållningssätt till forskning och ansvängningsskrivande och en gemensam förståelse för egna forskningsstyrkor och extern konkurrens och möjligheter har utvecklats.
Alla tre KK-miljöer har kämpat för att öka och säkra sin tillgång till finansiering och kompetens under tioårsperioden, några miljöer med större framgång än andra.


För alla tre KK-miljöer har anslag från det egna lärosätet varit den viktigaste finansieringskällan under hela perioden. Denna typ av finansiering har ökat för samtliga tre miljöer.

Gällande rekrytering och säkerställande av tillgång till kompetens har de tre KK-miljöer överlag upplevt en positiv effekt från KK-miljöprogrammet. Alla tre miljöer har vuxit i storlek under tioårsperioden. Medan TransTech och FFI har haft en stabil tillväxt i antal heltidsekvivalenter inom forskning under perioden, har utvecklingen inom INFINIT fluktuerat mer under tioårsperioden, vilket följer av minskningen av miljön med målet att stärka dess profil mot slutet av perioden.

Samtliga tre KK-miljöer har mött utmaningar när det gäller att rekrytera forskare inom respektive forskningsområden. INFINIT har kämpat mest med att rekrytera och behålla vetenskaplig personal men även TransTech har mött utmaningar i att rekrytera inom en av deras delmiljöer. För FFI har rekryteringsutmaningen inte varit lika tuff som för de två andra, utan den har varierat beroende på position och delmiljö.
Ett viktigt mål med KK-miljö programmet är att stödja stärkandet av KK-miljöns profileringsförmåga, vilket innebär att centren ska kunna definiera sina vetenskapliga profilområden och strategiskt utveckla dessa så att miljön nationellt och internationellt när vetenskapligt erkännande och utgör en attraktiv partner i ett välutvecklat akademiskt nätverk. Detta bör i sin tur påverka profilering av lärosätet. Alla tre miljör har kämpat för att identifiera och uppnå en tydlig strategisk profilering i skärningspunkten mellan de deltagande delmiljörerna. Programmet ses som ett viktigt profileringsverktyg och akademisk profilering har varit en nyckelfråga i diskussionerna mellan KK-miljörerna, expertgruppen och KK-stiftelsen under hela perioden. Ledningen och forskarna vid alla tre miljör hävdar att deras profileringsförmåga har stärkts och specialiseringen har ökat till följd av programmet. Detta indikeras av en betydande ökning av publikationerna inom miljörnas fokuserade forskningsområden.


Medan utvecklingen av INFINIT har bidragit till en starkare profilering av Högskolan i Skövde har det varit en utmanande process att utveckla en sammanhängande miljö inom INFINIT. Medan utgångspunktken verkade relativt tydlig med tre delmiljörer som delade IT-basen, har den övergripande miljön haft utmaningar med att definiera sin kärna och sätta en tydlig riktning. De senaste 3-4 åren har INFINIT gjort stora framsteg när det gäller att begränsa omfång och stärka KK-miljöns akademiska profil. Som ett resultat har KK-miljön blivit mindre.

Från början uppfattades FFI av ledningen som ett verktyg för att fortsätta en redan pågående strategisk plan för att profilera Högskolan i Halmstad mot innovation och entreprenörskap. I det har Högskolan i Halmstad lyckats. De första åren var dock utmanande eftersom det visade sig svårt att verklig stärka integrationen mellan forskningsområden och att balansera och integrera forskning och utbildning. Sedan 2015 har dock flera viktiga åtgärder vidtagits, vilket har bidragit till att stärka profileringen av FFI genom vetenskaplig integration och integrering av forskning och utbildning.
Sammanfattning – Balansera och integrera forskning och utbildning


FFI vid Högskolan i Halmstad är den miljö som har ägnat balansen mellan forskning och utbildning mest uppmärksamhet. Mycket har gjorts för att skapa en bättre balans mellan forskning och utbildning. Högskolan i Halmstad har använt KK-miljöprogrammet som ett verktyg för att öka samspelet mellan forskning och utbildning genom utveckling av ”kompleta kedjor” för utbildning samt integrering av forskning i utbildning. En viktig utveckling i Halmstad är också konsolidering av utbildningsprogram och ökade krav på akademiska meriter för utbildningsledare vid universitetet.

Både på INFINIT och TransTech ägnades lite uppmärksamhet åt att balansera och integrera utbildning och forskning fram till 2015. INFINIT har de senaste åren utvecklat utbildningsprogram på avancerad nivå som är nära relaterade till forskningsprioriteringarna på INFINIT. Det har dock varit utmanande att få en betydande studentvolym i dessa program, vilket tyder på att det inte finns någon enkel lösning på att uppnå målet. Sedan 2017 har granskningen av ansökningar om finansiering även tagit hänsyn till hur projekten bidrar till balansen mellan forskning och utbildning. Aktörerna visar även mer medvetenhet om frågan än tidigare.

Sammanfattning – Samverkan med externa partners

De tre KK-miljöerna och respektive lärosäte hade olika utgångspositioner när det gäller samarbete med externa partners. Medan Mittuniversitetet och Högskolan i Skövde båda har en lång tradition av samverkan med industrin saknade FFI vid Högskolan i Halmstad samma starka kopplingar till externa partners. Trots detta har betydande förändringar skett i samtliga tre KK-miljöer när det kommer till extern samverkan.

Forskare vid Högskolan i Halmstads har traditionellt haft ett delvis begränsande lokaltperspektiv på samverkan med näringslivet. Högskolan har arbetat hårt med att hitta en tydlig roll i samarbeten och att hitta fördelarna i samverkan med industrin. Utvecklingen av KK-miljön har medfört stora förändringar i forskarnas attityder och de flesta av forskarna ser nu värdet av samproduktion med externa aktörer. KK-miljöprogrammet har även bidragit till utvecklingen av en framtidsstrategi för att förbättra interna förmågor för samproduktion. Strategin innebär bland annat att redan etablerade samarbeten stärks och utvecklas istället för att avslutas efter avslutat projekt. En annan ambition är att samverkan sker i ett mer nationellt och internationellt perspektiv, detta för att inte begränsas av industristrukturen i det lokala näringslivet.


**INFINIT** har haft en fortlöpande positiv utveckling av samarbete med externa partners. INFINIT har under tioårsperioden lyckats etablera flera nya partnerskap med industrin och den offentliga sektorn. Forskare vid miljön uttrycker att industrisamarbeten står för ett viktigt och meningsfullt bidrag till deras forskning. Samtidigt är det i huvudsak de enskilda forskarna som har kopplingar till INFINIT:s samarbetspartners. Det framgår också av att branschpartnerna saknar medvetenhet om att de arbetar med INFINIT eller vad denna forskningsmiljö innebärer.
4. The Biggest Challenges on the Journey
The Biggest Challenges on the Journey

Over the 10-year period, the three Knowledge and Competence Centres and their host universities have experienced many challenges that have hampered their achievements as well as the goal attainment of the Knowledge and Competence Centre programme. We have discussed, tested and nuanced the identified challenges through several rounds of interviews, meetings and workshops. We have thereby gone from a great variety of challenges to a shortlist that have received most attention by the participants and are seen as most relevant considering the results of the evaluation as well as the extent to which they can in fact be handled in the context of the programme. The following challenges have hence been identified,

First of all, the three Knowledge and Competence Centres, generally saw slow progress the first 4-5 years in the way of becoming operational, active and delivering results. Several explanations are given for the slow initial progress. First of all, it was a really big mouthful for all three centres and their host universities to engage in such a fundamental transformation process following the ambitious objectives of the programme.

The actors also lost valuable time in the first years not fully acknowledging the broader objectives and full potential of the Knowledge and Competence Centre programme as a tool for long-term structured development and profiling.

This was complemented by the universities’ lack of experience regarding how to work with developing a strategy for the centres, including formulating goals that are relevant to both the university and to industry, and to make hard choices, that are not all in everybody’s favour, and in turn be able to handle a lot of internal discussions and internal competition.

For all centres and their host universities there have been additional organisational challenges linked to the centres’ strategy and goal-setting, not least in regard to clearly defining what type of research projects should be within the centre and what type of projects should be outside. These are not choices that are usual or come easy, and it has caused both confusion and frustrations before things have settled.

Also, the development of the centres have in the early years been hampered by differences in expectations and understandings between the Knowledge Foundation and the host universities.
The Biggest Challenges on the Journey

The universities have not only experienced a new type of programme with quite big and unique ambitions of change. They have also experienced a **unique research financier engaging intensively and with high expectations and demands** on the management of the universities and the centres. It has been backed by an expert group and continuous surveillance of the development at the centres. The ambitions of the programme and the discussions and interferences with high expectations from the Knowledge Foundation are generally being accepted as effective measures today, but it is fair to say that it has taken some time getting used to by the management and the researchers at the three universities.

Finally, it is worth noting that the progress of the Knowledge and Competence Centres in the first years has been hampered simply by the **lack of managerial resources and to some extent also limitations of academic competences**. We find that the host universities did only realise at a later stage how much leadership attention and competence was really required to build a Knowledge and Competence Centre following the ambitious objectives of the programme. In addition, it is also our impression that the universities only at a later stage realised that they were expected to use their own funding for contributing to the development of the Knowledge and Competence Centres.

The evaluation leaves the impression that for two of the Knowledge and Competence Centres, namely INFINIT and TransTech, the **ability to secure more funding from a broader mix of KK-programmes and other financiers has not improved sufficiently**. FFI at Halmstad University has been more successful in attracting funding from a broader group of financiers but **has not succeeded in attracting much funding from research financiers only prioritising research quality like the Swedish Research Council**.

Several explanations can be given to why the ability to secure more funding from other financiers has not improved more than it has. One explanation is that the **quality assurance systems implemented at the three Knowledge and Competence Centres are primarily targeted at writing Knowledge Foundation applications** and are not directed directly at other financiers.

Another explanation is that writing applications and **gaining support from the Swedish Research Council or other research financiers is perceived to have lower success rate** compared to gaining support from the Knowledge Foundation.
The Biggest Challenges on the Journey

All three Knowledge and Competence Centres have also met challenges in recruiting researchers in their competitive research fields. INFINIT has struggled the most with recruiting and retaining scientific personnel.

The Knowledge and Competence Centre programme is seen as an important tool for developing new areas of expertise by combining academic strengths from different parts of the university.

The management and researchers at all three centres argue that their profiling abilities have been strengthened and specialisation has increased as a result of the programme. This is also indicated by a substantial increase in publications in the three centres’ targeted research areas.

It has been a big challenge for all three centres and their host universities to clearly define their scientific profile areas and strategically develop these.

All centres have struggled to identify and achieve a clear strategic profiling in the intersection of the participating sub-environments. The merger of these, and in turn the academic profiling, has been the core of the challenge.
5. Recommendations
Recommendations for future Knowledge and Competence Centre support

During the evaluation process we have noted a great deal of ambitions and suggestions for changes to improve the goal attainment of the Knowledge and Competence Centre programme. We have aimed to link these to the challenges identified and described above. Through further discussions in the workshops and continued analysis of the challenges and the supporting quantitative data, we have arrived at the following five suggestions for changes that are proposed to increase the effectiveness and goal attainment of the programme.

1. Strengthen application processes and early dialogue to ensure shared understanding of change missions. The evaluation shows that it is not a given that the university leadership, the centre manager and the Knowledge Foundations shares the same understanding of the changes that should be attained with the programme. We suggest to strengthen the application period to contain more dialogue and interviews with the applicants to Knowledge and Competence Centres. The Knowledge and Competence Centre programme is not classic research funding. It is a programme that aims to make a bigger change. It is hence important that the applying universities fully understand and is able to describe the change mission they enter into. A lot of time can be saved later on by investing time in the early application process and dialogue.

2. Ensure host university and rectorate commitment and engagement. The development journey of three Knowledge and Competence Centres shows that it makes all the difference when the rectorate is committed and engaged in the development. If the centre is seen as just another research activity, and plans and activities are not coordinated and aligned with those of the university, both the centre and the university loses. It is important that the Knowledge Foundation is clear in expressing that the universities are expected also to use their own funding for contributing to the development of the centres. To avoid wasting valuable time in the early years, the Knowledge Foundation shall ensure strong rectorate commitment and engagement.

3. Strengthen the managerial level of Knowledge and Competence Centre. The evaluation documents the importance of sufficient capacity and academic and leadership competences at the management level of the centres. The importance of the centre leader should be recognised and more resources and attention should be devoted to this position. The programme should focus more on supporting the centre leadership by providing training and invite to the sharing of experiences at common meetings across the centre managers. Annual meetings were initiated by the centres themselves about halfway through the programme and are described as very helpful and useful. A lot can be gained from more networking, knowledge sharing and mutual learning across the centres. Besides managerial competences the right person needs to have strong academic merits to be able to ensure research quality and drive the academic profiling. It is important to involve both the academic leaders (dean) and managers with mandate at the institutional/school level. It is also recommended that an external reference group is established for each centre to support this level.
4. Continuous measurement and follow-up on central KPI’s. To measure development in performance and to have clear criteria and precise metrics is more important than most stakeholders acknowledge. For a research financier like the Knowledge Foundation that takes a quite unique role in actively and continuously following its donations, engaging in committing dialogue and providing advice to the management of the Knowledge and Competence Centres and their host universities, it is even more important.

It is equally important as a basis for an expert group if a such is a part of the monitoring and advising exercise. We have noticed that the development of stronger strategic abilities at the universities are often followed by a stronger focus on metrics.

We suggest that initiatives are taken to improve the continuous measurement and follow-up on central KPI’s, to follow if the Knowledge and Competence Centres are on the right track. The knowledge Foundations has already done some work on establishing metrics to describe the development of complete environments, which can serve as a good starting point.

5. Higher priority to internationalisation in all forms. It has been interesting to observe that all Knowledge and Competence Centres at the end of their 10-year development journey argue that internationalisation is really important. We also hear the argument that the programme does not provide sufficient measures for supporting internationalisation, e.g. recruitment of international researcher and instruments that would target outward internationalisation.

There is no doubt that internationalisation is important for strengthening the Knowledge and Competence Centres’ academic profiling, research impact and for securing more financing. It is equally important to emphasise attracting more EU funding, focus more on international co-publication and to recruit the best researchers abroad.

We therefore suggest that the Knowledge Foundation enters into dialogue with the host universities regarding how internationalisation can be given higher priority within or in connection to the programme.
6. TransTech
Mid Sweden University
Summary of the development of TransTech Mid Sweden University

Mid Sweden University (MIUN) was granted a Knowledge and Competence Centre consisting of the two profile areas Fibre Science Communication Network (FSCN) and Sensible Things that Communicate (STC). Besides the two accepted profiles the application also included two other profiles: Health, Sport and Sports Technology (NVC) and Tourism and Experiences (ETOUR). To be able to include the two latter profiles, the Knowledge Foundation asked the university to show that the profiles could handle a quality assurance system necessary for the Knowledge and Competence Centre. The inclusion of ETOUR and NVC was thus postponed until they could fulfill the requirement.

The new Knowledge and Competence Centre struggled on several levels during the first years. The then deputy vice-chancellor at MIUN, Christer Fröjdh, was the first coordinator of the Knowledge and Competence Centre but was soon replaced by Jonas Harvard. Jonas Harvard lacked subject knowledge within the research areas that the Knowledge and Competence Centre was focused around and communication problems between the university leaders, the centre management and the Knowledge foundation were substantial in the first years.

In 2012, it was decided that all applications for Knowledge Foundation funded projects should go through the university’s quality assurance system. Further, in effort to bring together the four profile areas, a strategic summit for all four profiles was held. The two initiatives turned out not to be enough and in 2013 ETOUR and NVC were rejected to be included in the new Knowledge and Competence Centre by the Knowledge Foundation. It was thus decided that the new Knowledge and Competence Centre at MIUN was only to consist of FSCN and STC.

The most turbulent but also decisive period for the Knowledge and Competence Centre took place between 2013-2015. The rejection to include ETOUR and NVC happened around the same time as a review of MIUN called Assessment of Research and Coproduction 2013 (ARC-13) was finalised. The research areas included in the Knowledge and Competence Centre were hit by hard criticism of their strategic agenda which was deemed insufficient. The rejection of ETOUR and NVC and the ARC13 review are in workplans, progress reports, and interviews with centre leaders described as fundamental turning points for the development of the Knowledge and Competence Centre. Before the rejection of ETOUR and NVC, the vice-chancellor at MIUN was also the head of the Knowledge and Competence Centre.
Summary of the development of TransTech Mid Sweden University

The reason for the deputy vice-chancellor being appointed head of the Knowledge and Competence Centre was because the four original profiles belonged to two different faculties within MIUN: ETOUR and NVC belonged to the Faculty of Human Sciences (HUV) while FSCN and STC belonged to the Faculty of Science, Technology and Media (NMT).

Further, the geographical centre for ETOUR and NVC was at the Östersund campus while NMT's geographical centre was at the Sundsvall campus some 200 km away. However, as the centre now only came to consist of research profiles from the NMT Faculty, the deputy vice-chancellor stepped down as the Knowledge and Competence Centre leader. A new management structure for the centre started forming by the end of 2013 and was implemented in the beginning of 2014. FSCN and STC already belonged to the same faculty but was now being integrated with the same common management structure. The two profiles were historically disparate in terms of balance between research and education. FSCN being very research focused and STC being focused on education. Integrating them under the same management structure was a way to help the profiles learn from each other. The Dean of the NMT Faculty, Prof Hans-Erik Nilsson, was appointed new coordinator and head of the centre, succeeding Jonas Harvard. A new steering group for the centre was also formed consisting of the new coordinating head Prof Hans-Erik Nilsson, the FSCN director Prof Kaarlo Niskanen, and the STC director Mattias O’Nils. Prof Kaarlo Niskanen started acting as strategic editor while Prof Mattias O’Nils were given responsibility over the quality system.

During the same time as the ARC13 review was conducted and the development of the new management structure was in progress, a new strategic vision for the Knowledge and Competence Centre was created. The strategic vision was called Transforming the Industrial Ecosystem (TIE) and was described as a first step to define a common goal for the joint research centre of FSCN and STC, while at the same time deepening the collaboration between research and industry.

TransTech’s collaboration with industry had until 2014 mostly focused on the already existing long-term relationships with big forest industry companies. However, a new strategy for the industry collaboration started forming in 2014 under the influence of the Knowledge and Competence Centre programme. The new strategy was in many ways a response to a critique from the Knowledge Foundation about the centre being stuck in old industry relationships.
Summary of the development of TransTech Mid Sweden University

The new collaboration strategy defined two different types of industry partners: 1) Core – industry fundamental companies focusing on resource efficiency; and 2) Edge – new businesses. Historically, FSCN had been working with Core companies while STC, being centred around IT, had been more involved with Edge companies. By integrating the two profiles, launching the TIE vision and defining companies as Core or Edge, the new strategy for industry collaboration was an important step towards bringing the centre together around a common theme.

When the turbulent years seemed to be over, the Knowledge and Competence Centre had to handle a temporary economic setback: cessation of funding from the EU regional funding programme (ERUF). In 2014, funding from ERUF constituted about one third of the external funding of the Knowledge and Competence Centre excluding in-kind. The ERUF funding went from SEK 22 million in 2014 to 700,000 SEK in 2015. In total, the external funding decreased by SEK 16 million between 2014-15. It wasn’t until 2018 that the ERUF funding was back on the same level as in 2014. The cessation of the ERUF funding should not have come as a surprise due to the inherent form of the funding program. The total funding of the centre was already in 2016 back on the same level as in 2014, mainly thanks to increased funding from the Knowledge Foundation.

The process of developing and implementing a new quality assurance system started as soon as the new management structure was implemented with the STC director responsible for the quality system. The new system was finalised and implemented in 2014 and fully operational by 2015. The new quality system forced all applications for Knowledge Foundation funding to go through the system. Since the initial implementation, the quality system has continuously been updated by for example including an advisory board, H-index and requirement of a competitive analysis. In 2020, the university is preparing to implement the quality assurance system developed in the Knowledge and Competence Centre throughout the whole university.

Before 2016, the two research profiles FSCN and STC had separate plans and goals for each coming period. As of 2016, the separate plans were discontinued, and new plans were made for the Strategic Actions. The Strategic Actions overlap the two research profiles and aim to bring the centre tighter together. The Strategic Actions have been updated since 2016, new ones have been added and some have merged. There were five Strategic Actions in 2020: XGeMS, KM2, InFibra, EISS and CellFunc. Out of the five, KM2 and EISS have existed since 2015.
Summary of the development of TransTech Mid Sweden University

To signal that the Knowledge and Competence Centre was now one common unit, it was given a common name: Transformative Technologies (TransTech).

The balance between academic quality and industry collaboration tilted towards working with industry during the first 5-6 years of the journey of the centre. In the workplan presented in 20 centreus shifted to building a ‘complete environment’ by setting up specific goals for developing the education programmes and including higher scientific ambitions in the quality assurance system.

TransTech has continuously struggled with increasing the level of internationalisation of the research centre, and the current vice-chancellor has identified internationalisation as one of the big challenges going forward. Further, the on-going transformation in the paper industry is still challenging the research traditionally conducted in FSCN. While STC is experiencing increasing interest from researchers and the industry, the traditional partners for FSCN have been decreasing relatively steady the last five years, which naturally forces FSCN to reconsider their relevance and find new ways forward. A challenge the Knowledge and Competence Centre is now well-prepared for.
Short description of TransTech

The Knowledge and Competence Centre Transformative Technologies (TransTech) at Mid Sweden University (MIUN) is formed of the two research centres FSCN and STC that collaborate with a mixture of forest industry and ICT challenges. FSCN (Fibre Science and Communication Network) carries out research in support of the development of forest-based industries and new opportunities for forest-based biomaterials. STC (Sensible Things that Communicate) carries out research that develops sensor-based systems and services for use within Internet of Things and IT. TransTech is based at Mid Sweden University’s campus in Sundsvall.

FSCN was established in 1999 and has thus existed long before the Knowledge and Competence Centre at MIUN was initiated. There has always been a close collaboration between FSCN and the Swedish forest industry and their suppliers. The research centre mainly focuses on increasing industry profitability by improving resource and process efficiency and supporting the development of new bio-based products. STC also existed before the Knowledge and Competence Centre was established and operates within electronics and computer sciences with a focus on industrial IoT, next-generation measurement systems and functional surfaces.

TransTech works with a regional agenda for research, innovation and education together with municipalities and companies. The research aims to contribute to growth, transformation and innovation for the partners within the research centre. The shared goal of FSCN and STC within TransTech is to support the transformation of the industrial ecosystem (TIE). The TIE vision was initially formed to:

i) exploit the competitive advantages of the region,
ii) choose opportunities from a global perspective,
iii) use information technology as a key enabler,
iv) adapt to changing markets
v) supply competence and skills, and
vi) profile the most exciting future opportunities

By linking FSCN and STC, and thereby the forest industries with information technology, TransTech aims to create an industrial ecosystem with particularly exciting prospects, regionally and nationally.
TransTech in numbers
Academic merits

The quantitative markers, including the bibliometric, financial and personnel development, all confirm a relatively slow start of the Knowledge and Competence Centre at Mid Sweden University.

The per year volume of publications published from the Knowledge and Competence Centre has increased over the studied period from 2011 to 2019. Figure 6.1 shows the volume of publications published from TransTech and indexed in Scopus between 2011-2019. The publication volume shows a decreasing trend up until 2015, going from 113 publications in 2011 to 84 in 2015. The trend turns in 2015 and the publication volume increases from 84 to 154 in 2019. The number of publications published in 2019 is the highest throughout the whole studied period.

55 pct. of the publications from TransTech in the period between 2011-2019 are classified as articles in the Scopus database. Conference Paper is the second most common type of publication published by TransTech. Out of the 1,084 TransTech publications, 439 (or 40 pct.) are Conference Papers. Articles and Conference Papers make up 95 pct. of all publications from TransTech. The remaining 5 pct. of the publications are either categorised as a Review or Other*.

Source: Mid Sweden University (2020)
* Other includes Note, Article in Press, Data paper, Editorial, Erratum, Letter, and Short Survey.
Academic merits

Almost one fifth of the publications from TransTech published over the period 2011-2019 belongs to the Scopus research area *Engineering*, which is also the largest research area for TransTech according to publication categorisation in Scopus.

The second largest research area for TransTech is *Physics and Astronomy* (18 pct.), followed by *Materials Science* (16 pct.) and *Computer Science* (11 pct.).

The top 10 research areas for publications from TransTech are shown in Figure 6.3.

In total, 94 pct. of the publications from TransTech published between 2011-2019 belong to any of these top 10 research areas.

Source: Mid Sweden University (2020)

Note: A publication can be categorised as more than one research area.
Academic merits

Redirecting the focus from publication volume to the scientific quality, Figure 6.4 shows the average scientific impact of the publications from TransTech over the studied period. The scientific impact describes to what extent the publications from TransTech are cited compared to three different regions: Sweden, the Nordic countries, and the OECD countries.

The citation level is adjusted in respect to publication year and subject area (defined in Scopus). The dotted line in the figure displays the normalised average impact level for each comparison region.

The scientific impact of the publications from TransTech lies on average 7 percentage points lower than comparable publications from Swedish institutions during the studied period. The impact level is lower (11 percentage points) compared to publications from Nordic institutions.

Compared to publications from institutions in OECD countries the scientific impact of the publications from TransTech is one percentage point higher. The average impact level of the TransTech publications is thus slightly lower when compared to Sweden and the Nordics, but on par when compared to OECD institutions.

Source: Mid Sweden University (2020)
Academic merits

To examine how the scientific impact has developed over time, Figure 6.5 illustrates the scientific impact of publications from TransTech over time. The graphs show that the impact level has been relatively stable during the whole period. The impact level of publications from TransTech has been higher than comparable publications from Swedish institutions in two of the examined years (2014 and 2017) and lower the rest of the years.

2017 stands out as a year of high scientific impact for the TransTech publications compared to all three benchmarks. Compared to publications from institutions in OECD countries, the impact level of publications from TransTech was 50 percentage points higher. However, as Figure 6.4 show, the scientific impact level is on average lower when comparing to Sweden and the Nordic countries. In the Swedish Research Council’s bibliometric index*, it becomes clear that it is mainly the publications in Computer Science that contribute to the positive development in the second half of the 10-year period of TransTech.

In the progress report from 2020 it is noted by TransTech that improvements in terms of publication volume and scientific impact is of high importance in the continuous development of the Knowledge and Competence Centre.

Source: Mid Sweden University (2020)

*) Detailed information about the bibliometric index is found on the follow link: [Bibliometric Index](#). A figure showing the development of the bibliometric index for TransTech is found in Appendix 2.
**Academic merits**

Figure 6.6 and 6.7 complement the previous figures by showing the share of publications from TransTech that are published in top ranked journals and the share of publications that are among the top cited publications. All comparisons are made in respect to publication year and subject area.

13.9 pct. of the publications from TransTech are published in the top 10 pct. ranked journals, 7.3 percent in the top 5 pct., and 1.7 pct. are published in the top 1 pct. ranked journals.

The publications from TransTech are not only published relatively more often than the average in the top ranked journals, but they are also cited more often. 14.2 pct. of the TransTech publications belong to the top 10 pct. most cited publications with respect to publication year and subject area. 6.9 pct. of the publications from TransTech are among the top 5 pct. most cited publications and 1.5 pct. are among the top 1 pct. most cited publications.

The results of the academic merits analysis implies that the top publications from TransTech are published in top ranked journals and are also cited above average with respect to publication year and subject area.

However, the average scientific impact level imply that the scientific quality and dissemination varies a lot between the top and bottom publications from TransTech.

*Source: Mid Sweden University (2020)*

*Indexed in Scopus.*
Germany and Italy are the two countries that TransTech has collaborated the most with. That becomes clear when examining co-publications with international institutions.

Figure 6.8 lists the top 10 countries (excluding Sweden) TransTech has co-published with. 97 of the publications have been co-published with at least one author affiliated with a German institution, while 87 of the publications have been co-published with at least one author from Italy. China is the third most common country TransTech has collaborated with indicated by its co-publications.

The institution TransTech shares most co-publications with is Stockholm University. 50 of the publications from TransTech has been co-published with at least one author from Stockholm University, which is displayed in Figure 6.9. Stockholm University is followed by European Spallation Source, Deutsches Elektronensynchroton, Lund University and Acreo Swedish ICT AB. Acreo is since 2018 part of RISE Research Institute of Sweden. On the top 10 list of collaboration partners only one of the organisations, ABB AB, is an industry partner.

Source: Mid Sweden University (2020)
Academic merits

41 pct. of the publications from TransTech are co-published with at least one author affiliated with an institution outside of Sweden (international author), and 18 pct. are co-published with at least one author affiliated with a firm rather than an academic institution.

Figure 6.10 shows the percentages of co-publications of the publications published between 2011-2019 for TransTech. The international and industry collaboration will be further examined in the following sections.

![Figure 6.10: Number of co-publications (top 10 countries)](image)

41% International collaboration

18% Industry collaboration

Source: Mid Sweden University (2020)
Note: A publication is an international collaboration if there’s at least one author located outside Sweden on the author list. A publication is an industry collaboration if there’s at least one author affiliated with a firm on the author list.
Financial analysis

Overall, the funds spent on research per year has increased for TransTech between 2011-2019. Figure 6.11 describes the development at TransTech. Following a similar pattern as the publications, the total funds for research decreased at TransTech between 2011-2015. In 2011, the funds (excluding in kind) was SEK 110 million compared to SEK 102 million in 2015. Between 2015-2019, the annual funds increased each year. The total funds for the Knowledge and Competence Centre (excl. in kind) were hence SEK 161 million in 2019.

To further examine the decreasing funds between 2013 and 2015, Figure 6.12 divides the funding into five different groups of financiers: Knowledge Foundation funds, University’s own grants, public actors, private financiers, and Swedish foundations. The category Swedish foundations mostly consist of funding from public actors but is not fully excluded from private financiers which is why it is presented in a separate category. Mid Sweden University has not been able to separate the funding from public actors and private financiers in this category and since the total funding of this category is relatively low the overall analysis will not be affected by this category. Some of the financiers in the Swedish foundation category include Wallenberg Foundation, VINNOVA and the Swedish Energy Agency.

Figure 6.11: Total financing from 2011 to 2019 in SEK million.

Source: Mid Sweden University (2020)
Financial analysis

Figure 6.12: Development in financing divided by types of financiers of TransTech from 2011 to 2019 in SEK million

Source: Mid Sweden University (2020)
Note: The Knowledge Foundation funds are excluded from “Public actors”.
Note 2: Swedish foundations include Wallenberg Foundation, Swedish Research Council, VINNOVA, Riksbankens Jubileumsfond, and the Swedish Energy Agency.
Financial analysis

The decrease of funding between 2013-2015 is highlighted in Figure 6.13. The reason behind the decrease can be derived from a large decrease in funding from public actors. When examining the funding data, it is clear that the decrease is caused by a cessation of EU funding between 2014-2015. EU funding thus decreased from SEK 22 million in 2014 to only 700,000 SEK in 2015.

As can be seen in Figure 6.11 and 6.12, the cessation of EU funds is partly fended off by an increase in funding from the Knowledge Foundation and other Swedish foundations. Funds from the Knowledge Foundation increased by SEK 7 million between 2014 -2015 and by SEK 3.5 million from other Swedish foundations.

The public actors’ category is basically made up of EU funding and funding from public research councils such as the Swedish Research Council and Formas. As noted, EU funds make up the larger part of this category. EU funds add up to around SEK 206 million throughout the studied period while the funding from other public actors only constitute a little less than SEK 12 million. The centre’s ability to attract external funding other than from the Knowledge Foundation can thus be questioned. The need for improving the ability to attract external funding is highlighted in the 2020 progress report.

Figure 6.13: Total financing of TransTech divided by types of financiers from 2011 to 2019

Source: Mid Sweden University (2020)
Note: The Knowledge Foundation funds are excluded from “Public actors”.
Note 2: Swedish foundations include Wallenberg Foundation, Swedish Research Council, VINNOVA, Riksbankens Jubileumsfond, and the Swedish Energy Agency.
Development in personnel

The personnel included in TransTech at Mid Sweden University has increased during the whole period. Figure 6.14 shows that 137 people were included in the Knowledge and Competence Centre in 2011, while 172 were included in 2019. Further, the figure shows how the personnel is divided between the two research centres constituting the centre.

From the figures it becomes clear that the overall increase in personnel included in TransTech stems from a near 40 pct. increase in personnel at the research centre STC. There were 73 people included in STC in 2011 while the number has increased to 101 in 2019. At the same time, the number of people included in FSCN has increased from 64 to 71. From a personnel perspective, FSCN was at its highest in 2015 when 83 people were included in the research centre. The relatively large decrease in personnel within STC that are observed between 2013-2014, from 69 to 41, can be explained by the cessation of EU funds and the re-organisation of the centre during those years.

The personnel category that has increased the most between 2011-2019 is postdocs. When the Knowledge and Competence Centre started in 2011 there weren’t any postdocs included in the centre. By 2019, the number of postdocs had increased to 27. The main part of the increase happened between 2018-2019 when the number of postdocs increased from 12 to 27. 12 of the postdocs are active in the FSCN research centre while 15 are connected to the STC research centre.

TransTech can also be divided into different Strategic Actions (which will be explained in forthcoming sections). Some of the Strategic Actions have changed names and taken new forms as a result of the development of the centre. Figure 6.15 shows the development in personnel of the Strategic Actions, as they are named in 2020.

The reason for the vanishing of personnel within CellFunc in 2019 is because CellFunc had already become a part of InFibra. The other three Strategic Actions are of similar sizes with respect to personnel, in 2019, varying between 34 and 41. The personnel within EISS has more than doubled between 2011-2019, even though EISS experienced a decrease in personnel from 16 to 7 between 2013-2014. XGeMS and KM2 show similar slightly increasing developments of the number of personnel between 2011-2019.
Development in personnel

Figure 6.14: Development in personnel per research centre, 2011-2019

Figure 6.15: Development in personnel per Strategic Action, 2011-2019

Source: Mid Sweden University (2020)
Development in personnel

Figure 6.16 shows the development in full-time equivalents doing research at TransTech and per research centre. When comparing the graphs in Figure 6.14 to the graphs in Figure 6.16 it is evident that while the development of personnel has increased between 2011-2019, the development of full-time equivalents doing research has been relatively stagnant. The number of full-time equivalents doing research has increased by only three, from 96 to 99, between 2011-2019 for the whole Knowledge and Competence Centre.

Finally, Figure 6.17 displays the total sum of full-time equivalents for education per research centre between 2017-2019. It is a metric that is only available from 2017. The total sum of full-time equivalents for education is very low for TransTech and has decreased over the three-year-period: from 16 to 11. The low number of full-time equivalents for education is partly explained by the organisational structure of Mid Sweden University. A large part of the employees who are only teaching, that is; not doing research, are not included in any of the two research centres within TransTech. The balance between research and education will be examined in more depth in next sections of the report.
Choice and mix of programme types

The choice and mix of Knowledge Foundation programme types that have been utilised by TransTech mirrors the overall development of the centre fairly well. In total, 60 Knowledge Foundations projects have been initiated between 2011-2019.

Only 13 projects were initiated during the first three years of the centre. Even though both the Forskningsprofil (e2mp-rp) and Forskningsprofil+ (STC@MIUN) initiated in 2011 were intended to contribute to the Knowledge and Competence Centre, they started before the first work plan of the centre was launched. The Forskningsprofil+ was an extension of a Forskningsprofil initiated in 2005. No new projects were initiated in 2012, and in 2013 only four smaller projects were initiated. Thus, the staggering first years of the Knowledge and Competence Centre that is evident in the bibliometric, financial and personnel data is also manifested in the choice and mix of programme types.

HÖG has throughout the whole period been the most common project type for each year. In total, 29 of all 60 projects have been HÖG projects. During the last two years, however, the number of initiated HÖG projects has decreased significantly which shows a strategic shift away from delimited research projects.

![Figure 6.18: Distribution of types of programmes](image)

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Source: Mid Sweden University (2020)
Note: Initiatives are noted in the year they were started, not when they were applied for.
The first Företagsforskarskola within the Knowledge and Competence Centre was introduced in 2014 (FORIC) and it was further expanded by FORIC+ in 2017. Except for three AVANS initiated in 2016 and 2017, one Flexible Master-by-Research (IT i högre utbildning) introduced in 2014, and one Expertkompetens initiated in 2019.

The two Företagsforskarskola projects are the only education focused KK-projects initiated in connection to the Knowledge and Competence Centre during the studied period. The balance and interaction between research and education is further examined later in this report, but overall, it is evident that the initial focus of the centre was on research rather than education.

The strategic shift from delimited research questions to bigger projects focusing on improving and consolidating the research centre can be seen in 2015 and 2016 when three Synergi projects were initiated. The total funding sum of the three Synergi projects (approx. SEK 43 million) almost amounts to the total funding sum of the 12 HÖG projects initiated between 2011-2014 (approx. SEK 46 million).

The first utilisation of the Strategisk kunskapsförstärkning-project took place in 2016, and in between 2017-2019 it is the most frequently initiated project type at TransTech. The eleven initiated Strategisk kunskapsförstärkning can in large be seen to complement the bigger Synergi projects. The overall strategic shift from delimited research projects to larger projects is confirmed in the presented data.

Finally, TRansTech’s second Forskningsprofil (NIIT) was initiated in 2019 and is primarily connected to the Strategic Action EISS and the STC research area.

An application for a third Forskningsprofil, connected to the Strategic Action InFibra and the FSCN research area, is being prepared.
Strategic and organisational abilities
Strategic and organisational abilities

In accordance with the quantitative analyses of bibliometric, financial and personnel data, the strategy, management and governance structures show limited progress during the initial years of the Knowledge and Competence Centre at Mid Sweden University (MIUN).

MIUN was granted a Knowledge and Competence Centre in December 2011 consisting of two profile areas: Fibre Science Communication Network (FSCN) and Sensible Things that Communicate (STC). Besides the two accepted profile areas, the application also included two other profile areas: Health, Sport and Sports Technology (NVC) and Tourism and Experiences (ETOUR).

The inclusion of NVC and ETOUR in the Knowledge and Competence Centre was however held off by the Knowledge Foundation until they could fulfil the requirement of handling a quality assurance system necessary for a Knowledge and Competence Centre. Since the four profile areas were part of two different faculties at MIUN (FSCN and STC: Faculty of Science, Technology and Media (NMT), NVC and ETOUR: Faculty for Human Sciences (HUV)), the then deputy vice-chancellor Christer Fröjdh was appointed coordinator for the Knowledge and Competence Centre. Besides belonging to two different faculties, the four profile areas were also separated geographically. FSCN and STC were located at the MIUN campus in Sundsvall while NVC and ETOUR were located at the Östersund campus. It demanded a lot of resources to bring the faculties together within one common centre theme, which relatively soon led to the appointment of Jonas Harvard as the new coordinator of the Knowledge and Competence Centre succeeding Christer Fröjdh. The new coordinator role was fully dedicated to coordinating the development of the new Knowledge and Competence Centre.

One of the first actions that was taken was to arrange a common strategic summit for all the four profiles to sort out a plan on how to bring the relatively disparate faculties together around a common research theme. Nevertheless, the centre kept struggling on consolidating the four profile areas around a common theme.

In hindsight, the managerial group recognised that the Knowledge and Competence Centre lacked a common management and governance system in 2013. Rather, the centre consisted of several separate projects.
Strategic and organisational abilities

NVC and ETOUR were rejected to be included in the Knowledge and Competence Centre in 2013. The profile areas did not meet the Knowledge Foundation’s expectations, and MIUN could not motivate how NVC and ETOUR would fit the Knowledge and Competence Centre. The rejection to include NVC and ETOUR happened around the same time a review of MIUN was finalised. The review, Assessment of Research and Coproduction 2013 (ARC13), struck down hard on several parts of the strategic agenda of the research profiles included in the Knowledge and Competence Centre as being insufficient. The rejection of NVC and ETOUR in combination with the ARC13 review are throughout workplans and interviews with centre leaders described as fundamental turning points for the development of the Knowledge and Competence Centre.

The exclusion of NVC and ETOUR meant that the whole Knowledge and Competence Centre was now located within the NMT faculty. Having the whole Knowledge and Competence Centre within one faculty had substantial implications for the organisational structure of the Knowledge and Competence Centre. A new management structure for the Knowledge and Competence Centre started forming in the end of 2013 and was implemented in the beginning of 2014.

FSCN and STC already belonged to the same faculty but was now integrated under the same common management structure using the same processes.

It was no easy task, since the two profiles have historically been disparate in terms of their balance between research and education, with FSCN being very research focused and STC being very education focused. Integrating them in the same common management structure was a way to help the profiles learn from each other, which will be further explored.

The Dean of the NMT faculty, Prof Hans-Erik Nilsson, was named the new coordinator and head of the Knowledge and Competence Centre, succeeding Jonas Harvard. A new steering group for the Knowledge and Competence Centre was also formed, consisting of Hans-Erik Nilsson, the FSCN director Prof Kaarlo Niskanen and the STC director Mattias O’Nils. Prof Kaarlo Niskanen started acting as strategic editor while Prof Mattias O’Nils were given responsibility over the quality system. The operative leadership of the Knowledge and Competence Centre was thus strengthened, with clear strategic mandates and roles.
Strategic and organisational abilities

In 2014, a new strategy was formed: TIE – Transforming the Industrial Ecosystem. The new strategic initiative, adding to the separate strategies for FSCN and STC, would bring the two research centres together by working to transform the industrial ecosystem focusing on research, innovation and coproduction. With the new theme, Mid Sweden University would focus on making a strong contribution to the regional renewal and growth within the forest industry, ICT, and other related industrial sectors.

The transformation challenge would further require a shift of focus from improved manufacturing efficiency to more innovation. This led to another strategic initiative in close connection to TIE, which gave new definitions to collaboration partners: Edge and Core. A simplified distinction of core and edge companies is that core companies tend to work in more traditional fields while edge companies are new businesses.

Before 2016, the two research centres FSCN and STC had separate plans and goals for each coming period. As of 2016 the separate plans were discontinued, and new plans were made for the Strategic Actions. Focusing on the Strategic Actions, which overlap the two research centres, rather than FSCN and STC was done in an effort to bring the centre tighter together. The Strategic Actions have continuously been updated, new ones have been added and some have merged. There were five Strategic Actions in 2020: XGeMS, KM2, InFibra, EIiss and CellFunc. Out of the five, KM2 and EIiss have existed since 2014/2015.

To signal that the Knowledge and Competence Centre was now one common unit, the Knowledge and Competence Centre was finally given a common name: Transformative Technologies (TransTech). Until 2016, TransTech was simply called “The Knowledge and Competence Centre”.

While the strategy has been updated and developed since 2013, mainly by the TIE vision, Core/Edge formulation, and the Strategic Actions, the management of TransTech has remained. The structures that were set during the turbulent years after the rejection of NVC and ETOUR are to a great extent still intact in 2020. While a new vice-chancellor assumed in 2017, the steering group still consists of the same three persons as it did in 2013/2014.
Strengthening quality assurance
Strengthening quality assurance

At the beginning of the Knowledge and Competence Centre, the Knowledge Foundation required MIUN to clarify the accountability of the quality assurance system for all four profile areas initially included in the centre. While FSCN and STC met the requirements, the inclusion of NVC and ETOUR were rejected in 2013 partly because of failing to embrace a transparent and functioning quality system. This section will focus on the development within TransTech and leave out the initial development within NVC and ETOUR since they never became a part of the Knowledge and Competence Centre.

Before a quality assurance system was specifically designed and implemented for the Knowledge and Competence Centre, it was decided in 2012 that all applications for KK-projects had to go through MIUN’s general quality system. The general quality system was naturally not designed to meet the specific criteria for the different programme forms set by the Knowledge Foundation. However, applications to all other kinds of funding (including funding from the Knowledge Foundation) went through the system which granted it as a functioning general quality assurance system.

The first quality control function developed specifically for the Knowledge and Competence Centre was implemented in 2013 and focused on HÖG projects. During the time, HÖG projects were the most common funded projects within the centre which explains the focus of the quality control function. As mentioned in previous sections, the new management structure was being developed around 2013-2014, appointing the STC director Prof Mattias O’Nils responsibility of the quality assurance system. The specific quality control function developed for the HÖG projects was hence the first step in the process of creating a new quality assurance system for the whole Knowledge and Competence Centre.

TransTech’s own quality assurance system was first implemented in 2014 and consisted of five main processes: 1) Strategic process, 2) Quality process, 3) Reporting process, 4) Administrative process, and 5) Communication process. Professor Mattias O’Nils is the System Manager, but each main process has a specific process leader responsible for that process. The Strategic process involves actions to develop and implement the Knowledge and Competence Centre strategy and is led by the head of the Knowledge and Competence Centre Prof Hans-Erik Nilsson. The quality in new and ongoing activities is ensured in the quality process, while reports and plans of the Knowledge and Competence Centre to the financiers are prepared in the Reporting process.
Strengthening quality assurance

Administrative support to all processes within the quality system is given in the administrative process. Finally, all communication, internal and external, is planned and handled in the Communication process. The quality system is a yearly process which is initiated in November during the strategic review.

The implementation of the quality system did not only have an implication for the projects within the centre. All project applications to the Knowledge Foundation had to go through the implemented quality system.

The people involved in the Knowledge and Competence Centre recognised that it took some years after the formal decision to implement the new quality assurance system was taken in 2014 until the system was fully operational throughout the centre. Researchers initially experienced that the new system significantly increased the administrative burden and planning connected to the application processes.

During the time of the implementation, the Knowledge and Competence Centre did still not have a specific name nor a common strategy, and this contributed to irritation among the researchers. Some years later, when the new management structure and strategy was set, the new quality assurance system naturally made more sense. The quality assurance system has continuously been updated since the first implementation in 2014. However, the form of the processes has remained. An advisory board was added to the process in 2016 to review borderline cases before applying. In 2018, the quality process of the quality system was updated by implementing new quality indicators such as H-index for citations and number of papers submitted to high-impact journals.

Further, the strategy process was improved by performing competitive analyses for EISS, KM2, and InFibra by documenting the national and international research environment revolving the Strategic Actions. The competitive analysis is however still under development, lacking a check for research novelty in its current form.

No further major improvements are currently planned for the quality assurance system at TransTech. Rather, the focus is on improving the support to researchers in grant applications and article writing. Further, as the Knowledge and Competence Centre programme is about to end, MIUN prepares a continuation of the quality assurance system developed in the Knowledge and Competence Centre to the whole university.
Strengthening quality assurance

Even though the quality assurance system is anonymously emphasized as one of the most important results stemming from the Knowledge and Competence Centre, some of its effects can be questioned. The whole process around the quality system has affected the working methods and processes within the NMT faculty. Further, it has changed the strategic mindset of the whole faculty by inviting researchers to look beyond their specific projects and work towards a common goal.

Finally, it has become clear through the interview studies and workshop that the ‘pulse meetings’ has had an impact on working processes, quality assurance system and also the work of uniting FSCN and STC under TransTech. The pulse meetings are held twice a year. All parts of the centre are invited to the pulse meetings to follow up all on-going projects in order to secure fulfilment of plans. The pulse meetings first started within the STC research centre around 2018 and the concept was soon thereafter adapted by FSCN. The meetings are said to help improve the quality of the projects, lead to collective learning and reallocation of resources while at the same time help the researchers and steering group to notice possible synergies between different projects and thus increase the possibilities for collaboration between FSCN and STC.
Strengthening academic profiling
Strengthening academic profiling

The formulation of the TIE vision has been critical for the profiling of the Knowledge and Competence Centre. Before the TIE vision, the Knowledge and Competence Centre lacked a common theme and goal. The research was focused on the specific projects and the Knowledge and Competence Centre was not internally perceived as a unit. The TIE vision was immediately embraced by the Knowledge Foundation’s expert group when it was officially introduced in the 2015 workplan. The expert group further acknowledged that even though the initial explanatory model for the TIE vision was complex, the strategic implications of the common theme were well established among the researchers. The TIE vision was iteratively clarified through the following period of the Knowledge and Competence Centre.

It was however not until 2016 that the Mid Sweden Knowledge and Competence Centre received its name, namely Transformative Technologies. TransTech is however generally not used in external communication, as the FSCN and STC brands are still believed to have strong bonds with external partners. The TransTech brand is thus not used as a part of the academic profiling strategy.

The personnel data analysed in the previous sections indicated that the situation looked different for FSCN and STC. The number of people involved in STC has increased by almost 40 pct. during the period while FSCN has grown by 11 percent.

The interview studies and the workshop confirmed that FSCN has been facing difficulties in recruiting. The recruitment problems are also continuously stated in the workplans and progress reports. Between 2011-2019, the number of professors has decreased from 14 to 9 and PhD students have decreased by 50 percent during the same period – from 16 to 8. The academic and scientific profiling of FSCN has been aggravated by the general decreasing trend of interest in the fibre science research area. The creation of the Strategic Actions KM2 (2015) and InFibra (2018) is an attempt to spur the interest in the research area and create an attractive research centre more closely connected to the research within STC.

EISS (2015), a Strategic Action within STC, is pointed out as an important factor for driving the profiling of STC. The people involved in EISS has more than doubled during the studied period. The recruitment of Prof Mikael Gidlund in 2014 is emphasized as critical for the development of EISS.
A general difference between FSCN and STC that has been discussed in the interviews with leaders from the Knowledge and Competence Centre is the level of seniority. Historically, FSCN has been biased towards senior researchers while STC has had a larger share of junior researchers. It has been perceived as an easier task for STC to change work methods and organisational structure than for FSCN, partly due to the level of seniority. As senior researchers within FSCN have retired, it has been hard to find relevant replacements.

It has been recognised that the focus on internationalisation has increased around the time the current vice-chancellor was appointed in 2017. However, the low level of internationalisation is seen as a problem for MIUN as a university and is not isolated to the Knowledge and Competence Centre. The challenge has been raised in almost all workplans and progress reports but is still a challenge as of 2020.

As described in previous sections, the ability to attract external financing is still something that needs improvement. The quality assurance system may have increased the share of applications that are accepted, but the Knowledge and Competence Centre is struggling to attract funds from new financiers. Own grants from the university has continuously made up the by far largest share of the funding, followed by funds from the European Regional Development Fund and the Knowledge Foundation. Funds from the Swedish Research Council, Formas, Wallenberg and VINNOVA has increased since the start of the Knowledge and Competence Centre, but their share of the total received funding continues to be low.

Progress report 2020 remarks the need for better capabilities to secure balancing in funding when the Knowledge and Competence Centre period ends and points to the necessity of good support processes. Attracting new funds from a more diversified pool of financiers was identified as the top priority for the time after the Knowledge and Competence Centre by everyone interviewed working in the centre. The expert group has continuously emphasized the need of limiting the dependence on funding from the Knowledge Foundation and increasing the share of competitive funding. However, tangible solutions on how to secure balancing in funding are still absent.
Balancing and integrating research and education
Balancing and integrating research and education

The two research centres FSCN and STC have historically been very different in terms of their balance between research and education. STC has always had focus on education. FSCN, on the other hand, could almost be described as a pure research institution when the Knowledge and Competence Centre was formed in 2011. No academic programme was initially connected to FSCN.

In the halftime report (DAMVAD Analytics, 2017), it is described that there were 90 full-time students connected to FSCN and 601 connected to STC in 2011.

During the first couple of years of the centre, until the time around 2013–2014 when the new management group was formed, the educational part of the centre was barely mentioned in the workplans and progress reports. The initial lack of focus on education has been confirmed through the interview studies. Developing the educational side was not prioritised partly as a result of the relatively unstructured initial development of the Knowledge and Competence Centre. In 2014, a masters by research programme was started within the Knowledge and Competence Centre, which is understood as one of the first signs of an effort to interact education with research. Further, as the strategies for the Strategic Actions were formed in 2015, a goal was set up to have a master’s programme connected to each Strategic Action.

The interviewees have also mentioned that the KK-project form AVANS has been used to develop the master’s programmes for the Strategic Actions. The first time the Knowledge and Competence Centre at MIUN initiated an AVANS was in 2016, when they initiated two AVANS. Another one was initiated in 2017. The Centre at MIUN felt an increasing pressure from the Knowledge Foundation around 2016 to focus more on building a ‘complete environment’. The shift of focus was noted by the university board of MIUN which emphasised the need for a closer interaction between education and research. As of 2020, all but one of the civil engineering programmes are related to the Knowledge and Competence Centre.

Going from being identified as a research institute to focus more on education generated a lot of stress within the FSCN research centre, according to the interviews and workshop. Integrating education and research has generally been described as a big change in the work culture, inevitably taking time and energy from research. There is still a lot of work to be done to integrate education and research, but the importance of the interaction is now accepted throughout the whole organisation. The Knowledge Foundation is generally credited as the driver and initiator of the development regarding the interaction between education and research.
Collaboration with external partners
Collaboration with external partners

For TransTech at MIUN, co-production and collaboration with the industry was initially the central point for the majority of the research projects. In particular for the research conducted at FSCN which was closely connected to the regional forest-industry. Holmen, Stora Enso, and SCA were some of the key partners for FSCN when the centre started in 2011. STC did not have a similar regional focus as FSCN but instead had ABB and Ericsson Research as some of the key partners. In total, 32 partner companies were identified by the centre in 2011.

The type of collaboration partners and collaboration forms differed between FSCN and STC already from the beginning, and the collaborations with external partners have also developed in different ways since. There are two major events that have affected the development of the collaboration with external partners for TransTech: 1) the Core/Edge definition and 2) Knowledge Foundation’s redefined emphasis on academic excellence.

Core and Edge refers to a framework of how to think about industry partners. The framework was first mentioned in the workplan from 2015 and is closely tied to the TIE vision described in the previous sections. Core refers to industry partners related to the core of the Knowledge and Competence Centres research areas, while Edge refers to partners in new areas of research and coproduction needed in order to drive industrial transformation. Simplified, core companies operate in more traditional sectors and edge companies operate in emerging sectors. Core companies are in general larger companies while edge companies are smaller. According to the interviews core companies have traditionally been more connected to FSCN than to STC.

Until the new framework of core and edge was described, the centre was criticised by the Knowledge Foundation for not developing enough new relationships with industry. Between 2011 and 2014 the pool of partner companies grew from 32 and 42 and mostly included core companies. In the progress report from 2020, MIUN indicates that there are 93 partners companies involved in TransTech, whereof most of the partner companies are defined as edge companies.

The changed constellation of partner companies has affected the collaboration forms between the industry and the centre. Core companies are usually larger than edge companies and have traditionally preferred to work in large scale experiment projects based in factories.
Collaboration with external partners

Larger companies obviously have more resources than smaller companies and were able to participate in projects with no other, or few other, industry partners. The shift towards working with smaller edge companies has resulted in including more companies in relatively smaller projects. The large-scale projects were often time-consuming and did seldom result in several publications. The researchers experience that the shift from large-scale projects to smaller projects has resulted in more effective scientific production.

A last note on the core and edge framework that was discussed during the workshop is the strained relationships with some of the historical key partners. Some of the core companies think the prioritisation of edge companies results in the Knowledge and Competence Centre, and ultimately MIUN as a university, losing its regional connection. STC has been criticised for not collaborating enough with regional partners, and the regional partners are concerned FSCN will follow that development if their focus is also shifted more towards edge companies. The management group and the vice-chancellor noticed that the regional collaboration partners often belong in the core category and have stressed the importance not to oversee these partnerships.

The regional connection is crucial for the university and emphasized in the most recent university-wide strategy documents.

The second event that has had a major impact on the collaboration with external partners is the perceived updated emphasis on academic excellence from the Knowledge Foundation. The shift of focus from industry collaboration to academic excellence by the foundation was first felt around 2015/2016, which is around the same time the foundation started to communicate the need of building ‘complete environments’ (see previous section about research and education). More weight was put on reaching academic excellence, rather than coproduction with industry. During the workshop, the collaborating companies discussed how this has affected the collaboration for them in terms of an increased ‘academisation’: More resources are tied up to the application and quality assurance process which often delays the projects. In some projects the increased focus on academic excellence also implies the added value for the companies decreases when less resources are focused on the coproduction. With the relatively demanding requirements of industry co-financing of the projects, the added value for the co-financing companies should not be disregarded when formulating the goals.
7. INFINIT
Skövde University
Summary of the development journey of INFINIT University of Skövde

The development of the Knowledge and Competence Centre INFINIT at University of Skövde has led to a stronger profiling of the university by bringing technological and digital areas to the fore. This is especially the case for the research areas of systems biology and engineering. The stronger profiling has led to an increased interest within the technological degrees and an increase in the student volume in these areas.

Along with the development of the Knowledge and Competence Centre, the management and the researchers have found a more strategic approach towards their surroundings. In addition, the culture has changed in the whole organisation to become more cooperative and collective. Our survey with relevant actors from INFINIT support this overall view of INFINIT, as almost 80 pct. of the participants find that INFINIT has been a success overall.

The analysis of the 10 year development journey further shows that the Knowledge and Competence Centre programme has been a functional tool to build a strong quality assurance system in and around INFINIT. There has been a systematic effort to develop a quality assurance system which has resulted in a continuously improved system gradually being implemented in the university.
Summary of the development journey of INFINIT University of Skövde

Important quantitative markers of the development of INFINIT, including number of publications, financial development, and development in personnel show a positive development from 2011 to 2017. Around 2018, however, the positive trend reverses which brings many of the indicators back to a level similar to 2011. Our in-depth document studies, interviews, and the workshop with central participants in the centre show that the reversed trend is a result of a narrowing of INFINIT’s focus in the last couple of years, since a lot of effort has been put into sharpening the scope of the centre. Thus, the decrease in the overall performance is rather a result of a sharper focusing of the research strategy for INFINIT. This is in itself an indication of the more strategic approach of the Knowledge and Competence Centre which has unfolded at this late stage in the development.

It has been a challenging process to develop a coherent research centre within INFINIT as well as creating a shared and focused strategy that could be expanded to influence the university. While the starting point seemed rather clear from the centres point of view, namely three research centres which shared the IT-base, the centre struggled to define its core and to set a clear direction. A challenge which was highlighted by the expert group.

This was exemplified by the fact that the name "INFINIT" was first put in place around 2015. The quantitative indicators show that there has been a steady increase in the attraction of funds from the Knowledge Foundation. The project type with the highest frequency is under the HÖG programme. However, since 2012 a yearly directive from the vice chancellor has been used as a strategic tool to guide the project applications in other funding directions. The directive has thus encouraged researchers to apply for other types of financing and since 2016 it has also stated restrictions with HÖG projects.

Although INFINIT has been able to attract funding they have not to the same extend managed to recruit employees to carry out the projects. The challenge is illuminated by the large churn of programme managers. INFINIT has seen eight programme managers come and go, which is remarkable. It is likely that the high churn rate has disrupted and affected the strategic development of the centre.

Finally, INFINIT has succeeded in building partnerships and collaboration models with the industry which are rewarding for both INFINIT and its external partners. There is a need for a clearer communication strategy around INFINIT as the participating companies are not sufficiently familiar with the scope and vision of INFINIT.
A system for quality assurance is developed

Quality assurance works well. Each research proposal is reviewed by two co-production reviewers and two scientific reviewers.

External preparation group established who read and align applications.

Quality assurance system fully structured and in place.

Quality assurance system extended to applications that are not for the Knowledge Foundation.

Grant’s Office established

Evaluation committee established in which hearings regarding large project applications are conducted.

Quality assurance system is being implemented in the University.

Timeline of INFINIT

2011

A yearly directive send out by the vice chancellor to align INFINIT to the strategy of the university

Operational management group established with three representatives from research specialisations, one project coordinator and one administrative coordinator.

Network established between the three centres.

Steering group takes over responsibilities of operational management group. Head of school is now part of the steering group.

Dialogue meetings with the steering group are put in place to create a common view of the development.

A roadmap for each research specialisation is developed to create a focused strategy that contributes to the continuity of the research content and the development of the centre as a whole.

2012

The research specialisations develop their own strategies in order to state clearer ambitions with each area and synergies between them.

New institutional division with five profile areas.

The acronym INFINIT is chosen as the name of the research centre.

2017-2022 strategy for the university. Corresponds with INFINIT’s focus on digitalisation of business.

Collaboration platforms established within the three research areas.

2013

Research groups established within each specialisation.

Positive development in scientific publishing and recruitment.

2014

The number of full-time staff peaks

Publication in scientific journals peaks

Remarkable drop in number of doctoral students.

2015

Questionnaire send to companies regarding their experiences with co-production.

Increased focus on applying for other programmes than HDG. Also Synergi, Avans, Prospekt and Rekryteringar are of interest.

First Avans, SIDUS and Synergi projects.

Directive from vice chancellor states restrictions with HDG applications.

The quality assurance system includes the aspect of linking research and education.

INFINIT has advanced level educational programmes that closely relate to the research. However, the challenge is to get a reasonable student volume.

2016

Continuous struggle with recruiting and retaining senior staff who can contribute to building a complete research centre.

Choice and mix of programme types

Balance between research and education

External factors and collaboration

Academic/scientific profiling ability

Systems, working methods and processes

Strategy, governance and organisation

Yearly directive send out by the vice chancellor to align INFINIT to the strategy of the university

Operational management group established with three representatives from research specialisations, one project coordinator and one administrative coordinator.

Network established between the three centres.

Steering group takes over responsibilities of operational management group. Head of school is now part of the steering group.

Dialogue meetings with the steering group are put in place to create a common view of the development.

A roadmap for each research specialisation is developed to create a focused strategy that contributes to the continuity of the research content and the development of the centre as a whole.

Continuous struggle with attracting funding from other financiers than the Knowledge Foundation

New programme manager

New vice-chancellor

2017

2018

2019

2020

2021

2022

2023

2024

2025

2026

2027

2028

2029

2030
Short description of INFINIT

INFINIT’s overall focus and purpose is generating, quality assuring, analysing and visualising data, with support of information technology systems and models, with the purpose of supporting decision-making.

With INFINIT as a prioritised research centre, University of Skövde strives to become one of the leading actors in the area of interaction between education, research, and innovation in areas where information technology systems and models are developed. Also, there is a large focus on using these systems and models to create new knowledge in close collaboration between academia and business. The ambition is that the work in INFINIT leads to developing the university as a long-term sustainable academic centre with prominent positions.

INFINIT is constructed around three research areas, all closely related to IT:

1. Virtual Engineering (VirEng)
2. Information Technology (InfoTek)
3. Systems Biology (SysBio)

The ambition is to utilise the common denominator in IT, and to contribute to developing the competitiveness of businesses through co-production.

The research within VirEng aims to help the manufacturing industry to utilise digitisation opportunities to achieve efficient and flexible production. The new knowledge must be relevant and implementable not only in the manufacturing industry but also in industries such as healthcare, transport, and telecom.

The research in VirEng is related to InfoTek, as information technology is used in a variety of industries and also a fundamental part of the development of the digital society. For example, by using advanced and innovative methods, techniques, and tools it is possible to conduct analysis of complex data and systems as well as quality control of software.

Another area of use of information technology is the development of biological knowledge which makes research within SysBio strategically positioned in relation to research in InfoTek. SysBio use and develop informatic tools and methods which, through analysis and calculations of large amounts of data, can lead to new knowledge about the biological systems.
INFINIT in numbers
Academic merits

This section provides a descriptive analysis of all the relevant and available quantitative data for INFINIT from 2011 to 2019. First, the academic merits will be analysed, followed by the financial data analysis. Thereafter, the development in personnel will be described and finally the choice and mix of KK-programme types funding INFINIT has received will be reviewed. The quantitative review will form the basis for the rest of the analysis.

The academic development within INFINIT is first assessed by the number of publications. Overall, the number of publications has increased over the 10-year period, as Figure 7.1 visualises. Since 2011, the yearly number of publications has increased from 99 to 143, which is close to a 50-pct. increase during the period.

The publications of INFINIT can be divided into different types, including; articles, conference papers, book chapters, and reviews. Publication through articles make up 50 pct. of INFINIT’s publications, as seen in Figure 7.2., while conference papers make up 40 pct. Taken together, 90 pct. of INFINIT’s publications are placed almost equally in these two categories.

Source: University of Skövde (2020)
* Other includes Note, Article in Press, Data paper, Editorial, Erratum, Letter, and Short Survey.
Academic merits

Computer Science is the most common research area in which publications from INFINIT has been published in between 2011-2019. 24 pct. of the publications from INFINIT that are indexed in Scopus are categorised as publications in Computer Science.

Figure 7.3 further shows that 15 pct. of the publications are indexed as Engineering publications and 11 pct. as Mathematics.

82 pct. of the publications from INFINIT are categorised as any of the top 10 research areas shown in the figure.

Source: University of Skövde (2020)
Note: A publication can be categorised as more than one research area.
Another way of assessing the publication performance of INFINIT is by analysing the scientific impact of the publications by citations. The scientific impact of the publications from INFINIT is on average in line with the scientific impact of publications from other Swedish and Nordic research institutions. The scientific impact describes to what extent the publications from INFINIT are cited compared to three different regions: Sweden, the Nordic countries, and the OECD countries. The level of citation is adjusted in respect to publication year and subject area (defined in Scopus). The dotted line in the Figure 7.4 displays the normalised average impact level for each comparison region.

The total number of publications from INFINIT between 2011 to 2020 have on average reached a higher level of scientific impact compared to institutes from the OECD countries. INFINIT's publications have been cited 13 pct. points more than comparable publications in the OECD countries.

When using Sweden and the Nordic countries as a benchmarks, INFINIT scores 1 pct. point over the normalised average for publications from the Nordic countries and 3 pct. points over the normalised average for publications from research institutions in Sweden.

Figure 7.4: Impact of publications: INFINIT

Source: University of Skövde (2020)
Academic merits

Looking across the studied period the scientific impact has increased compared to all three benchmarking regions. Figure 7.5 shows that the impact level has been fairly stable between 2011-2015, circulating around the normalised average impact level of all regions.

Even though the scientific level is below average compared to Sweden and the Nordic countries in 2014, the development from 2014-2019 shows a steady increase through vis-à-vis all regions. This is quite remarkable, and INFINIT is the only Knowledge and Competence Centre of the three in focus that shows a clear research impact above average in all three categories. In the early days of INFINIT, publications within Engineering and Computer Science dominated the development of the bibliometric index of the Swedish Research Council*. Over the 10 year period, however, the contribution to the bibliometric index of Engineering publications has clearly decreased while the contribution of publications within Computer Science has steadily increased. Biomolecular publications have also seen a positive development over the period in regards to the index.

To further examine the academic merits, the following pages compares citations and publications in top ranked journals.

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* Detailed information about the bibliometric index is found on the follow link: [Bibliometric Index](#). A figure showing the development of the bibliometric index for INFINIT is found in Appendix 2.
Academic merits

INFINIT is in line with the average when examining publications published in top ranked journals. 12 pct. of the publications from INFINIT have been published in the top-10 pct. ranked journals during the examined period.

Figure 7.6 shows that 5 percent of the publications are published in the top 5 percent ranked journals and 0.7 percent are published in the top 1 percent ranked journals.

Focusing on citation level, Figure 7.7 shows the percentage of publications from INFINIT that are among the top 10, 5 and 1 pct. most cited publications within INFINIT’s research areas.

1.5 pct. of the INFINIT publications are among the top 1 pct. most cited and 6.6 pct. belong to the top 5 most cited publications. Finally, 14 pct. of the publications from INFINIT are among the top 10 pct. most cited publications within INFINIT’s research areas.

Source: University of Skövde (2020)
Academic merits

Reviewing the level of international and industry collaborations at INFINIT, 40 pct. of the Knowledge and Competence Centre’s articles draw on international collaborations. 17 pct. of the published articles draw on industry collaborations, as shown in Figure 7.8.

Researchers at INFINIT have collaborated with researchers from many countries over the last 10 years. INFINIT has especially had many co-publications with researchers from United Kingdom, Finland and the United States, as shown in Figure 7.9. 82 of all the publications have been co-published with at least one author affiliated with a British research institution, and 80 of the publications are co-published with at least one author from Finland.

Gothenburg University is the institution that INFINIT shares most co-publications with, as shown in Figure 7.10. 86 of the publications from INFINIT has been co-published with at least one author from Gothenburg University. Gothenburg University is followed by the University of Turku with 57 publications. Thus, Gothenburg University is by far the preferred research partner for INFINIT. On the top-10 list of collaboration partners, we find that seven of ten partners are universities while the other three are industry partners.

Source: University of Skövde (2020)
Financial analysis

The total financing of INFINIT has increased during the studied period. There has been a steady increase between 2012 - 2017 of approximately SEK 10 million each year, as shown in Figure 7.11. In 2012, SEK 59.3 million was attracted to research activities at INFINIT. Five years later in 2017, this number had increased with almost 45 pct. as it reached SEK 105.6 million. Since 2017 the total financing of INFINIT has stabilised around approximately SEK 90 million.

The development in the financing of INFINIT can be split into different types of financiers; The Knowledge Foundation (KK), own (university) grants, public financiers and private financiers. Figure 7.12 shows the development in the different types of funding in SEK million. The funding from The Knowledge Foundation shows a steady increase in the 10-year period. Own grants have also increased gradually, between 2011 and 2016 but decreases slightly thereafter.

The public funding increases between 2011 and 2016, after which it gradually decreases. This brings the funding from public financiers in 2019 to be SEK 5 million higher than in 2010. The private financing has not seen an overall development over the ten-year period, which will be elaborated in the following.

Source: University of Skövde (2020)
Financial analysis

Funding from the Knowledge Foundation has seen a steady increase and make up an increasing share of the total financing of INFINIT. Figure 7.13 displays the distribution of funds over the four financier categories for each year over the period 2010 - 2019. The share of funding from the Knowledge Foundation increases gradually, while the share of own grants varies more. In 2019, own funding makes up 33% which is a decrease from 42% in 2010.

Funding from public financiers consistently makes up between approximately 20 and 30%. Nevertheless, there is an overall decrease from 31% to 24% over the ten-year period. Thus, there has not been a remarkable development in INFINIT’s ability to attract public funding.

The attraction of private funding has not had a remarkable positive development either. The first four years of the period the private funding was decreasing. However, in 2019 the amount of private funding is almost similar with 2010, just over 4 million SEK. Throughout the 10-year period the private funding has not exceeded 10% of the total financing.

Source: University of Skövde (2020)
Development in personnel

There has been a positive development in the number of staff affiliated with INFINIT between 2011-2016: from 133 to 205. However, in the last three years of the studied period there has been a decrease in personnel, as seen in Figure 7.14. This figure shows the development of all staff and full time equivalents in INFINIT. The number of full-time equivalents (FTEs) has not varied much from 2011 to 2014. However, from 2015 and onward there is an overall increase. In 2015, there were 91 FTEs in INFINIT compared to 100 in 2019.

Figure 7.15 shows the percentage of staff doing research in INFINIT. The way of documenting the staff development changed in 2017, why this data is not available from 2018 an onwards.

Across the period there has been an increase in both staff and FTEs doing research. The percentage of staff doing research has increased from 43 pct. to 52 pct. whereas as the percentage of FTEs doing research has increased from 31 pct. to 39 pct. However, both groups peaked in 2017, as Figure 7.15 shows.

It is our understanding, that this is also the effect of the sharpening of INFINIT’s focus and its further prioritisation of research.

Source: University of Skövde (2020)
Choice and mix of programme types

INFINIT has used strategic knowledge reinforcement and recruitment throughout the period. These make up approximately 15 pct. of the portfolio. During the last five years, INFINIT has also begun working with Synergy projects, however they do not make up a large proportion of the portfolio. The number of projects does not vary remarkably from 2011 to 2019. However, there is an overall increase from 2010 to 2015, followed by an overall decrease between 2015 to 2020.

HÖG projects make up approximately 50 pct. of the portfolio. The analysis shows that HÖG projects are seen as easy to administrate and very effective because of their short time span and the fact that INFINIT has become very experienced in writing these applications. HÖG is followed by Prospekt (13 pct.), which have been a permanent part of INFINIT’s portfolio since 2014, due to a clear focus on supporting industry collaborations.

Since 2012 a yearly directive from the vice chancellor has been used as a strategic tool to guide researchers. The content of the strategic directive varied from year to year, depending on what the current need was in the centre. From 2016 and onward the need was to clearly restrict the use of HÖG, and thus broadening the scope of the centre concerning funding possibilities.

Source: University of Skövde (2020)
Note: Initiatives are noted in the year they were started, not when they were applied for. The data for 2019 initiative is not available at the time of this evaluation.

Figure 7.16: Distribution of types of KK-programmes

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Strategic and organisational abilities
Strategic and organisational abilities

INFINIT has struggled to find its core and to set a clear direction from which the research areas can work. This is exemplified in the fact that the name "INFINIT" was first put in place in 2015. This even happened with heavy involvement from the Knowledge Foundation who saw a need of bringing the centre together.

Survey results document that the majority of participants find that the Knowledge and Competence Centre programme has impacted the ability to develop INFINIT in accordance with strategy and goals. Nevertheless, in-depth interviews and the workshop with the relevant actors within INFINIT document that it has not been an easy journey to develop this strategy.

Throughout the years the three research areas constituting INFINIT have worked in various ways in order to create a research strategy. During the first years they developed their own strategies with the intention of stating clear ambitions within each of the areas. There was also an ambition to identify the synergies between the research areas. However, in practice there was not a large amount of communication between the areas. Instead a lot of resources were put into establishing the areas side by side and hence defining their individual identities.

Has the Knowledge and Competence Centre programme impacted the ability to develop INFINIT in accordance with strategy and goals?

- 5 - The KK-environment programme has had a significant positive impact
  - 4
  - 3
  - 2
- 1 - The KK-environment programme has had no impact
  - 8%
  - 4%
  - 12%
- Don't know

N: 25
Note: Verksamhetsplan KK-Miljö 2016-2018, Högskolan i Skövde
Strategic and organisational abilities

Since the research areas worked somewhat autonomously in the first half of the ten-year period, it was a struggle to define a shared strategy. However, in 2017 a new steering group was put in place. This steering group, as of 2017, includes the programme manager, representatives from the three schools (head or deputy head) involved in INFINIT, representative from the faculty board (the dean) and the administrative coordinator. This contributed to an increased alignment between the strategy of the university and the strategy of INFINIT. The management saw a need to support a more unified strategy within INFINIT as well, therefore dialogue meetings between the INFINIT management and the areas were implemented 2018.

In addition, in 2019, the research areas were urged to develop roadmaps to identify a focused strategy*. In these each research area describes their focus areas and milestones. The roadmaps are hence used to structure and follow up on development of the areas. The research areas were also asked to develop a strategy that contributes to the continuity of the research content within the specific area as well as the development of the centre as a whole. Thus, the roadmaps identify the research direction of each sub-environment respectively, as well as connected strategies such as financing and recruitment strategies.

One of the interviewed actors stated, that the three research areas would typically be placed in different faculties, because of their different focus. These differences have made it difficult to create a shared strategy which indicates that INFINIT could have benefitted from narrowing down their focus even more and at an earlier stage. This could have sharpened how the research areas are to contribute to the overall goal of the centre. This was also discussed at the workshop, and there seems to be a broad agreement on this point.

It also becomes clear in our interviews that it would have been an advantage to work with these roadmaps earlier in the development process. This could potentially have resulted in a common strategy much earlier and secured a more streamlined effort across the research areas. As the roadmaps have been put in place so late in the process the research areas are not used to working together towards a common goal. Another participant states, that the three areas do not have a full understanding of each other’s strategies and how they individually contribute to the overall strategy of INFINIT. However late, the roadmaps have seemingly contributed positively to the research areas by addressing their strengths and weaknesses and by giving them tool to communicate their own research goals.

*INFINIT uppföljningsrapport verksamhetsåret 2018, Högskolan i Skövde
Strategic and organisational abilities

During the first three-year period INFINIT existed as an isolated unit. Although the first programme manager, was the pro-vice chancellor, the centre didn’t succeed in drawing upon the knowledge and experiences from the leading managerial level. In our workshop, it was brought up that INFINIT had lost three years of development in this early period. Nevertheless, our survey shows that 80 pct. of the respondents find that the ability to develop an organisation and management to support the research centre has been build up over the ten-year period. The ability has been build up through a number of actions taken by the changing managements of INFINIT.

In 2013 the management of INFINIT found it necessary to secure a flow of information and knowledge between the areas. For that purpose, an operational management group was established which included a manager and representatives from the three research areas. This management group facilitated more communication across INFINIT. However, our interviews indicate that the increased information was not really experienced by researchers in the individual research areas. The operational management group was functional until in 2017, when it was replaced by a steering group, as described on the previous page. This was put in place in order to create a better connection between INFINIT and the rest of the university. In addition, the management saw a need of a new structure for communication between the steering group and the research areas in order to ensure a common understanding of INFINIT. In 2018 dialogue meetings with the research areas were put in place in order to accommodate this need.

Has the Knowledge and Competence Centre programme impacted the ability to develop an organisation and management which supports the implementation of formulated strategies for all of INFINIT?

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<tr>
<td>5</td>
<td>The KK-environment programme has had a significant positive impact</td>
<td>40%</td>
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<td>4</td>
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<td>40%</td>
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<td>3</td>
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<tr>
<td>2</td>
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<td>8%</td>
</tr>
<tr>
<td>1</td>
<td>The KK-environment programme has had no impact</td>
<td>4%</td>
</tr>
<tr>
<td>Don’t know</td>
<td></td>
<td>4%</td>
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N: 25
Note: Verksamhetsplan KK–Miljö 2016–2018, Högskolan i Skövde
Strategic and organisational abilities

Our interviews show that the development of the steering group and dialogue meetings have contributed to a larger transparency and understanding of the strategy of INFINIT, and of how it is connected to the university. Nevertheless, the overall impression is that the organisational structures have been rather unclear over the years. It has been a struggle to define a clear division of responsibilities within the management, and making sure that researchers and other actors, within as well as outside INFINIT, are informed about the structures. The challenge is connected to the big turnover of programme managers.

During the last couple of years constructive measures have been put in place to improve on the challenges described above, and with good results. We see that strategic focus in recent years has on utilising the profiled research directions, and to develop the educational profile, by reorganising the whole university. We see that the development of INFINIT is now much more in line with the strategy of the university. It is being acknowledged by the management that the development of INFINIT to a very large degree has contributed to the development of the strategic and organisational abilities of the university. As a result the university now also explicitly highlights the development towards “complete centres” for the whole university.
Strengthening quality assurance
Strengthening quality assurance

There has been a continuous and constructive work effort put into developing and implementing a quality assurance system for the application process in INFINIT. The system is developed to evaluate applications and industry collaborations and has been in focus from the very first years. It has had a big impact on the way the Knowledge and Competence Centre and the university work with quality assurance. Our survey underlines this point, as almost 80 pct. of the participants find that the Knowledge and Competence Centre programme has impacted the ability to follow up and evaluate the academic work in INFINIT. However, it was also brought to the fore at our workshop that the increase in the quality of research and publications in INFINIT has not been as large as expected.

Already in 2012, the initial version of the quality assurance system was in place for applications for projects to the Knowledge Foundation. To ensure that the scientific projects and the collaboration projects were of high quality and were assessed properly each research proposal is reviewed by two co-production reviewers and two scientific reviewers, who assess different aspects in the same proposal. Both national and international experts were selected for the ambitious reviewing process.
Strengthening quality assurance

In INFINIT the quality requirements are closely aligned with the programme forms set by the Knowledge Foundation. For each programme type they have developed a template that mirrors the requirements for the specific programme type. The management started by developing a template for applications for HÖG projects, in order to get an overview of what the Knowledge Foundation weighted and prioritised in an application. This came to be a constructive tool to guide applications. Therefore templates were developed for each programme type. In these templates several aspects of a project are covered, such as scientific quality, strategic direction, and coproduction.

Since 2012 a number of actions have been taken to further develop the QA system. In 2015 an external preparation group was established to contribute to the reviewing of applications, hence more resources were ascribed to quality assurance. Since the management assessed that the quality assurance process was working well it was decided to extend it to other types of applications. Since 2016 the working process has been used for all applications within INFINIT and not only the applications to the Knowledge Foundation. To apply the QA process directly to all applications has turned out, however, to be a challenge, as it is not easy to transfer the QA process to other funding agencies.

The year 2017 marked another important milestone for the quality assurance system as a Grant’s Office was established to support the quality work further. The office was put in place in order to support the reviewing of applications within INFINIT, since the same methods were now used for all applications. It was a way of aligning the reviewing and quality assurance in one organisational structure. In 2018, following the implementation of the Grant’s Office, a Evaluation committee was established in which hearings regarding large project applications are conducted.

The big effort put into developing the quality assurance system has had a clear impact on the working culture within INFINIT. Several researchers state, that they have seen a development in the way of seeing projects as a possibility to build up the centre rather than just focusing on the individual project. The researchers have been required to reflect over their project to a larger extend, in order to get them through the system, thus being more aware of the research centre as a whole.

Note: *Verksamhetsplan För INFINIT 2017, Högskolan i Skövde*
Strengthening quality assurance

Even though the QA system is well functioning within INFINIT, it has been a challenge in regard to the collaboration with businesses that the review process is rather extensive. Even though there are several feedback loops in the quality assurance, it is only possible to evaluate a project in its full form when the final application is submitted. Companies often operate with a shorter timeline for projects and experience frustration when working on an application for a long time only to have it rejected.

Despite this challenge, it is our impression that INFINIT has succeed in establishing and maintaining constructive partnerships with industry. This will be further examined in the next sections.

Since 2018, the way of working with quality assurance has been adapted and implemented in the rest of the university which underlines the functionality thereof. If everything goes according to plan, the quality assurance system is implemented at the university as a whole in the beginning of 2021, thus a significant marker of INFINIT’s dispersal effects, which will be further explored in the following sections.

*INFINIT uppföljningsrapport verksamhetsåret 2018, Högskolan i Skövde
Strengthening academic profiling
The development of INFINIT has contributed to a strong profiling of the University of Skövde, especially during the last 4-5 years. It has brought technological and digital areas to the fore. This is especially the case for the research areas of systems biology and engineering. The stronger profiling has in turn led to an increased interest within the technological degrees and an increase in the student volume in these areas.

However, it has seemingly been a challenging process to develop a coherent research centre within INFINIT. While the starting point seemed rather clear from the centres point of view, namely three sub-centres which shared the IT-base, the overall centre struggled to define the core and to set a clear direction. A challenge which has also been highlighted by the expert group. It was further exemplified by the fact that the name "INFINIT" was first put in place around 2015. The last 3-4 years INFINIT has hence made a lot of progress in narrowing its scope and strengthening the academic profile of the centre.

INFINIT’s profiling efforts have been hampered by the centres’ lacking ability to recruit and retain scientific employees to carry out the research projects and to commit to the centre. This has been a challenge since the retainment of staff is critical in the process of building a complete research centre. Another complementing challenge is the large turnover of programme managers. INFINIT has seen eight programme managers come and go, which is remarkable. In addition, our interviews point to the fact that the programme managers have not all had sufficient knowledge and competencies directly related to the scope of INFINIT. The programme managers have had varying backgrounds and areas of expertise which has added to changing focus and ways of managing the centre. It is our understanding, that the importance of a qualified management has not been sufficiently prioritised. Thus, it is likely that the large turnover has affected the development of the research centre. In addition, our interviews point to the fact that if the steering group would have had a stronger mandate to make decisions, they could have taken on more responsibility in order to secure a continuous workflow and development across the different programme managers. It is also our assessment that the programme managers have had different ways of prioritising their time and ways of taking on the tasks of being a programme manager. The most recent programme manager seems to have an actual expertise within the scope of INFINIT which has contributed to a stronger and more focused management. However, he has recently switched to a new job and will now be replaced by the ninth programme manager of INFINIT.

Note: INFINIT uppföljningsrapport verksamhetsåret 2018, Högskolan i Skövde
Strengthening academic profiling

The struggle with recruiting scientific personnel is indicated by the quantitative numbers. As described in previous sections, there was a positive development in the number of staff in INFINIT from 2011 to 2017. Followed by a decrease in the numbers which means that the number of staff is lower today than in 2011. The decrease in the numbers of staff from 2018 is due to the narrowed scope and sharpened profile of INFINIT, according to the management.

However, interviewees also explain that one reason is that the recruited personnel does not stay in INFINIT for long. Many have left their positions after only a couple of years, which it problematic for the continuous building of knowledge and competencies. There is a broad understanding between the interviewed personnel that this has to do with the lack of strong leadership. These management issues have thus affected the ability to recruit and retain academic staff, and in turn the overall development and profiling of INFINIT. It has also been mentioned in several interviews that the slow progress in the centre’s profiling has impacted the ability to attract financing from other sources than the Knowledge Foundation. Many of the participants at INFINIT see a need for shared strategies, structures and processes that enable them to attract more financing from a broader group of funders than today.
Balancing and integrating research and education
Balancing and integrating research and education

INFINIT has experienced certain challenges with establishing a better balance between research and education. There have not been many initiatives put in place to improve the balance between 2010 and 2016. It is our understanding, that this is partly due to the fact that the previous programme managers have not had this as a priority. Also, it is the experience of some key actors, that the focus on balance between research and education was only stressed by the KK-foundation around 2015-2016, which is why we they did not pay much attention to the issue.

However, in 2017 an important step was taken to improve the balance, when the ambition was inscribed in the quality assurance system. Since 2017 the reviewing of applications has included ensuring that the projects contribute to this balance. Our interviews indicate, that this had a pedagogical effect and made the project managers aware of the important connection between research and education which they were not as aware of before. The connection of education to the research centres increased by the reorganisation of the whole university and the focus in INFINIT on developing "complete environments". Since 2018, INFINIT has developed advanced-level educational programmes that are closely related to the research in INFINIT. However, it has been challenging to obtain a substantial student volume in these programmes.

Thus, it seems that there is still some way to go in order to secure a transverse balance between research and education. In addition, there is an overall challenge with recruiting students, e.g. for the engineering degrees. The responsibility for recruiting lies with the individual departments including the department of marketing and communication. INFINIT is not an organisational unit and has no mandate to market training under its own brand. Nevertheless, it is important for INFINIT to acknowledge how the development in the educational programmes that are subject-wise within the centre looks like. The connection to education is hence incorporated in the overall strategy of INFINIT.

However, in order for the strategic priorities within INFINIT to have an effect both in research and in education, it is important that the prefects are involved. As of 2017, the head of department or deputy head of department of INFINIT’s steering group have been included. Our interviews indicate that this has affected the attraction of students positively. This can also be connected to the growing general interest for the thematic areas INFINIT covers, demographics and the development of the labour market. Several interviewees believe, that INFINIT was ahead of its time in relation to the areas they work in which are now trending nationally as well as internationally.

Note: From 2017 and forward it is clearly stated in the annual reports of INFINIT, how the different projects are connected to education.
Collaboration with external partners
Collaboration with external partners

Based on our interviews and the involving workshop, it is our overall assessment that INFINIT has experienced a positive development when it comes to developing the collaborating with external partners. Our interviews show, that over the years INFINIT has managed to establish many partnerships with industry and the public sector. On our workshop it was also made clear, that the researchers find the industry collaborations one of the most meaningful parts of the centre. It is fruitful for both INFINIT and the industry, and at the same time a great platform to market INFINIT as a strong research centre. For example, the university has been a Volvo Academic Preferred Partner in the field of engineering since 2009; a long-term collaboration that last year received a renewed agreement for the period 2019-2023.

Via collaboration platforms, INFINIT has a format for collaborating with companies in various ways. There are industry-specific platforms linked to the three research areas. SysBio’s collaboration platform is called BioS and was established in 2017. It largely brings together companies within Life Science. The platform ASSAR Industrial Innovation Arena, which was established in 2018 is linked to VirEng and InfoTec.

Has the Knowledge and Competence Centre programme impacted the ability to co-produce research and training initiatives of mutual benefit to INFINIT and industry? Where 1 corresponds to no impact and 5 corresponds to a significant impact.

Source: Damvad Analytics 2020
Note: Verksamhetsplan KK-Miljö 2016–2018, Högskolan i Skövde
Collaboration with external partners

This supports collaboration with companies in the manufacturing industry. Furthermore, the platform PICS was established in 2018 with a focus on information security and cyber security.

Our interviews and the workshop also show that it is mainly the individual researchers and research groups who attract new collaboration partners and retain existing ones. The industry partners are not necessarily aware that they are working with INFINIT or what the research centre encompasses. Thus, there is a potential in communicating more clearly about INFINIT when doing collaborations – for example it would be relevant to have a presentation with all collaboration partners in the beginning of a project to ensure the dissemination of knowledge about the program.

There is also an untapped potential in international centreion partners. Everything in INFINIT is written and communicated in Swedish, which makes it difficult to attract international partners. This is not only relevant to industry collaborations, but also to attracting international academic profiles and financiers. This is a topic that frustrates the researchers of INFINIT, as they see a larger international potential.

Note: Verksamhetsplan KK-Miljö 2016-2018, Högskolan i Skövde
8.

Research for Innovation
Halmstad University
The Knowledge and Competence Centre ‘Research for Innovation’ (FFI) has played an all important role in the development of Halmstad University the last decade, and the striving towards the goal of becoming “the innovation driving university”. The university has used the Knowledge and Competence Centre programme as a goal and a measure to support the development and the integration of research activities from the early start and until today. Interviews with representatives from the university point to the strategic importance of the Knowledge and Competence Centre programme, and that the university as a result of the programme has transformed significantly. The most notable developments include the integration of the university’s schools, increased research output as well as a strong emphasis on quality.

In terms of quantitative parameters, Research for Innovation’s publication volume displays an overall positive development. Almost half of the publications are part of international collaborations, while 9 pct. are part of industry collaborations. Further, the centre has had a positive development in funding throughout the period. Apart from 2012 – 2014, funding from own grants, public and private financiers has had a positive development, indicating an increased ability to attract external funding.

The Knowledge and Competence Centre has also experienced an overall positive development in the number of employees and full-time equivalents. However, the number of full-time equivalents has not increased to the same extent as the number of employees.

At the time when the programme was initiated, Halmstad University was challenged on several fronts. Much of the initial work focused on the individual research schools and to strengthen their capabilities to conduct research in their respective fields. The initial years were however unsuccessful in achieving the integration between research subjects. Another challenge was the weak link between research and education.

Over the ten year period, several important actions have been taken to strengthen scientific integration and to streamline educational activities and integrate research with education. Among the most important events were the disapproval of work plan 5 (VP2016) in 2015, which lead to stronger involvement from the deans of the individual schools in strategic decision making. Additionally, a major scientific review conducted in 2013, called ARC13, played an important role in developing the research focus at the university.
Summary of the development of FFI Halmstad University

FFI has over the period developed a new quality assurance system which has had an impact on the working culture within the university. Researchers now think of their research projects in relation to the development of the university, while considering it convention for their research proposals to be evaluated. Researchers also state a positive development in cooperation and knowledge sharing between the different parts of the university while sharing the same goals for development.

Over the years, FFI has collaborated with different types of partners, including firms, universities and science parks. Although some researchers within the Knowledge and Competence Centre has struggled to find their role and seeing the benefits of collaboration with Research for Innovation and companies, the development of the centre has entailed changes in opinions and most of the initially critical researchers now see the value of co-production with external actors.

In total, FFI realised 71 KK-programmes distributed over 14 different types. The most common programme type is HÖG, one third of all realised programmes within the Knowledge and Competence Centre have been of this type. The second most common programme type is international guest professors, which make up about 28 pct. of realised efforts during the period.

Although Research for Innovation is perceived as very successful by the staff within the centre, the Knowledge and Competence Centre has met some challenges on its development journey. While there have many collaborations all around, a continuous challenge has been the lack of suitable industry collaboration partners on a more long-term strategic level. Further, the university has, to some degree, struggled to effectively integrate the different research schools and to convince all researchers of the benefits of the centre.

Overall, would you say that Research for Innovation has been a success?

- Yes: 95%
- No / Don’t know: 5%
Short description of Research for Innovation - FFI

Research for Innovation is built on three research areas:

1) Innovation Science
2) Information Technology
3) Health Sciences

These are centred around two overarching profile areas: Smart Cities and Communities and Health Innovation.

The Knowledge and Competence Centre is seen as a tool for Halmstad University to profile the university as “the innovation driving university” and a key component in the university’s ambition to develop a unique scientific position in the intersection between the three subject areas.

The Knowledge and Competence Centre aims to realise its strategic goal by maintaining and developing the individual areas while at the same time developing novel capabilities in the intersection of the respective research fields. Applying the combined competencies and research of Health Innovation and Smart Cities and Communities to address societal challenges.

The research regarding Information Technology is conducted within Embedded and Intelligent systems. The objective of the research conducted in Embedded and Intelligent systems is to contribute to the creation of innovative IT-based goods and services through developing knowledge in various forms such as theories, tools or methods. This is executed within four technology areas: aware intelligent systems, cyber physical systems, digital service innovation and smart electronic systems. The research conducted within the Centre for Research on Welfare, Health and Sport aims to contribute to life quality in an equal and sustainable society within four research domains:

1. Sustainable growth,
2. Participation in a changing welfare society,
3. Health and social care of the future and,
4. Sustainable participation in sport and physical activity.

The research takes its starting point in identified needs and challenges and is carried out in collaboration with target groups and partners from organisations, public sectors and industry.
### Timeline of Research for Innovation - FFI

<table>
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<tr>
<th>Year</th>
<th>Event Description</th>
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<tr>
<td>2011</td>
<td>Main focus on research, goal: Change balance between education and research</td>
</tr>
<tr>
<td>2012</td>
<td>Development of Science Park Halmstad AB</td>
</tr>
<tr>
<td>2013</td>
<td>ARC13 leads to attitude change within the university, focus on strategic challenges and positive attention for HH's large feature of co-production</td>
</tr>
<tr>
<td>2014</td>
<td>VP 5 not approved</td>
</tr>
<tr>
<td>2015</td>
<td>HH leaves Science Park Halmstad AB</td>
</tr>
<tr>
<td>2016</td>
<td>HH conducts their own evaluation of master and bachelor education with external parties.</td>
</tr>
<tr>
<td>2017</td>
<td>IGP programme in order to profile the university, strengthen research and gain international contacts. The strategy is considered successful.</td>
</tr>
<tr>
<td>2018</td>
<td>Strategy for international positioning: developing Internet-based education and MSc</td>
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<tr>
<td>2019</td>
<td>New rector</td>
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<tr>
<td>2020</td>
<td>New programme manager</td>
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**Systems, working methods and processes**
- Establishment of system for developing proposals including units within and outside HH such as advisory board, advisory group, KK management, EKS and internal profile quality systems.
- Evaluation group
- Quality assurance system is considered stable
- New routine for recruitment proposals
- Workshops 3-4 times/year for developing efforts together with partnering companies

**Strategy, governance and organisation**
- Three research profiles BIS, CVHI & CIEL are established
- FUN is established and takes over the responsibility for the quality review process from the faculty board
- Education for research leaders is established
- "Research staff" introduced targeting research qual. and quant.
- New system for internal annual follow-up of educational programmes
- "Research staff" introduced targeting research qual. and quant.
- HH conducts their own evaluation of master and bachelor education with external parties.

**Academic/Scientific profiling ability**
- Health innovation start
- Reorganisation of management group's work: monthly meetings about strategic matters in smaller constellation.
- Education for Research leaders
- New system for internal annual follow-up of educational programmes
- FUN: increased incentives for Sc. journal publication

**External factors and collaboration**
- Continuous struggle with finding suitable companies to collaborate with due to Halland’s business structure being small and conservative

**Balance between research and education**
- Increase in number of people employed within the research profile
- Increase in number of published papers

**Document perspectives on innovation**
- Three research profiles BIS, CVHI & CIEL are established
- Health innovation start
- Reorganisation of management group's work: monthly meetings about strategic matters in smaller constellation.
- Education for Research leaders
- "Research staff" introduced targeting research qual. and quant.
- HH conducts their own evaluation of master and bachelor education with external parties.

**Research leaders**
- Health innovation start
- Reorganisation of management group's work: monthly meetings about strategic matters in smaller constellation.
- Education for Research leaders
- "Research staff" introduced targeting research qual. and quant.
- HH conducts their own evaluation of master and bachelor education with external parties.

**Innovation week**
- (2017) International conferences, research gatherings, international summer schools for PhD students
- Shift towards building more dynamic research centres through rejuvenation (less focus on strong individual professors building research centres)

**Advisory Board**
- Smart cities and communities start
- New deputy vice chancellor of innovation, cooperation & internationalisation
- Approval of follow-up and final reports moved from FUN to FFI's management
- Reorganisation of management group's work: monthly meetings about strategic matters in smaller constellation.
- Education for Research leaders
- "Research staff" introduced targeting research qual. and quant.
- HH conducts their own evaluation of master and bachelor education with external parties.
FFI in numbers
Academic merits

On the following pages, we describe Research for Innovation’s development in terms of publications, personnel and financing since the Halmstad University was awarded the Knowledge and Competence Centre. First, the development in terms of academic publishing is described.

Overall, there has been a positive development in the number of publications within Research for Innovation (FFI) over the period. In 2012 the number of articles indexed in Scopus was 93, as can be seen in Figure 8.1. The number of articles has since grown and peaked at 183 in 2018, corresponding to a 77 pct. increase. The decrease in articles from 2018 to 2019 may be explained by lagging of reporting to the Scopus database. Therefore, no decisive conclusions can be drawn from this drop.

The majority, 62 pct. of the publications are articles. The share constituted by journal articles has grown over the period. Following articles, the second most common publication type is conference papers. This type makes up 27 pct. of all publications seen over the entire period. The remaining share of publications consists of book chapters, reviews and other publication types.

Figure 8.1: Number of publications from FFI

Figure 8.2: Share of publications of total number of publications: FFI

Source: Halmstad University (2020)

* Other includes Note, Article in Press, Data paper, Editorial, Erratum, Letter, and Short Survey.
Academic merits

18 pct. of the publications from FFI over the period 2011-2019 are categorised as belonging to the research area Computer Science in the Scopus database. That makes Computer Science the largest research area of FFI according to the publication categorisation. Medicine (13 pct.) and Engineering (13 pct.) are the second and third most common research areas for the publications of FFI.

84 pct. of the publications from FFI are categorised as any of the top 10 research areas shown in Figure 8.3.

The scientific impact of FFI measured by citations has remained relatively stable over the period, with no clear trend visible. Scientific impact is defined as average citation rate compared to articles in the same field and published the same year.

Seen over the full period, the publications within FFI are cited somewhat (two pct.) less than average comparable articles in Sweden and Nordic countries as is visible in Figure 8.4. The dotted line in the figure displays the normalised average impact level for each comparison region. Compared to the OECD benchmark, articles are cited seven percentage points more than the average.

Source: Halmstad University (2020)
Note: A publication can be categorised as more than one research area.
Academic merits

The yearly development of scientific impact does not show any clear trend but has fluctuated around the previously mentioned averages as can be seen in Figure 8.5.

The impact levels of FFI publications compared to both the Nordic and Swedish average benchmarks are relatively stable around the average impact levels for most of the period. The OECD benchmark shows a higher degree of fluctuation, with publications from FFI scoring an impact level 10 percentage points over the OECD average for four of the analysed years.

The development for the Swedish Research Council’s bibliometric index indicates an increasing contribution of the research areas Economics and Computer Science. They are the main contributors to the development of the bibliometric index for the second half of the 10-year period. The contribution to the index by publications within Health has remained fairly stable throughout the period.

Source: Halmstad University (2020)

*) Detailed information about the bibliometric index is found on the follow link: Bibliometric Index. A figure showing the development of the bibliometric index for INFINIT is found in Appendix 2.
Academic merits

In the figures to the right the scientific excellence and quality of FFI is presented, defined as share of articles among the most cited publications and share of publications in the highest-ranking journals, respectively.

In terms of scientific excellence, just under 15 pct. of the publications from FFI are among the 10 pct. most cited in their research area. Further, just over 8 pct. of FFI articles are in the top fifth percentile in terms of cited articles within their respective research areas. Out of these, 1.4 pct. are in the top one percentile. Analysing the quality of the journals where FFI researchers have published, 14 pct. of publications are found in the top 10 pct. ranked journals. Furthermore, 6.6 pct. are published in journals that are in the top five and a little over 1 pct. have been published in the top one percentile journals.

The results indicate that there is a broad base of publications that have an impact on their respective research field. To some degree impact through high citations and publication in top journals are lacking. This picture becomes clearer when comparing the benchmarks in figure 8.4, where the impact is below the Nordic and Swedish average.

Source: Halmstad University (2020)
Academic merits

Reviewing the level of internationalisation and collaboration for FFI, just under half of FFI’s indexed articles draws on international collaborations. Meanwhile 9 pct. has been co-published with industry partners.

The centre has primarily collaborated with researchers from other Nordic and European countries. Figure 8.9 ranks the top ten collaboration countries for FFI. In total, 101 articles has been co-published with at least one author from the United Kingdom.

Apart from Nordic and European collaborations, researchers at FFI have published 84 articles with researchers from the United States, 52 articles with researchers from China and 41 articles with researchers from Brazil.

Over the period, FFI’s main collaboration partner has been Lund University. In total, 116 articles have been co-published with researchers from Lund University, as is shown in figure 8.10. All of the centre’s top ten collaboration partners are universities and most of the universities are Swedish. Only two of the top collaboration partners are non-Swedish universities, Kaunas University of Technology (Lithuania) and Rice University (US).

Source: Halmstad University (2020)
Financial analysis

Overall, FFI has had a remarkable increase in total funding for research since 2012. In 2019, the total funding for research reached SEK 146 million, which corresponds to, almost, a doubling of funding compared to 2012. The most prominent increase occurred from 2015 to 2016, when the funding increased with SEK 34 million.

When examining the development in funding based on types of financiers, it is apparent that FFI has broadened its financier ship over the course of the period. As shown in figure 8.12, funding from the Knowledge Foundation increased until 2016, thereafter, the trend is reverted. The most notable development can be found in the category public financiers, including financing from Swedish public financiers, the EU. This category decreased until 2014, when it only contributed with SEK 15 million to the Knowledge and Competence Centre. Since then, the role of public financiers has grown significantly, over 250 pct., and in 2019 public financiers contributed with SEK 53 million to the Knowledge and Competence Centre. The grants given to FFI directly from the university has also grown. In 2012 university grants contributed with SEK 30 million to the centre. this figure had doubled in 2019. The trend with less dependency on Knowledge Foundation has been a strategic objective for the University management.

Source: Halmstad University (2020)
NB: Knowledge Foundation funds are excluded from “Public actors”.

Figure 8.11: Total financing of FFI in SEK million

Figure 8.12: Development in financing divided by types of financiers
Financial analysis

While funding from the Knowledge Foundation has gone up and then down over the 10-year period, the share of grants from other public financers shows the opposite pattern. Figure 8.13 displays the distribution of funds over the four financier categories for each year over the period 2012 - 2019. The share of funding from own grants and private financiers have remained constant over the years. Funding from own grants made up 41-44 percent of the research funding for FFI while funding from private financiers have made up 4-7 percent of the total financing.

Meanwhile, the share of funding from the Knowledge Foundation saw an increase over the first years of FFI and peaked at 33 percent in 2015. It has since decreased, and in 2019 the share of funds for the Knowledge Foundation amounted to only 17 pct. At the same time, the share of funds from public financers decreased from 37 pct. in 2012 to a level of 18-19 pct. between 2014 and 2016. Since then the level has increased to 36 percent. The figure does not show the overall increase of funds over the period, but clearly indicates how funding from the Knowledge Foundation has been central for the development of the Knowledge and Competence Centre over most of the period and especially in middle years of 2014-2016.

Source: Halmstad University (2020)
NB: Knowledge Foundation funds are excluded from “Public actors”.

Figure 8.13: Total financing of FFI divided by types of financiers from 2012 to 2019
Development in personnel

FFI has seen an overall positive development in terms of the number of employees, full-time equivalents and full-time equivalents within research during its 10-year development. Meanwhile, the centre does not display any consistent trends regarding the development in doctoral students or advanced, licentiates or doctoral degrees.

During most of the years, FFI has had a positive development in number of employees. The number of employees peaked in 2018, with 496 people employed within the Knowledge and Competence Centre but has since decreased. In 2019, the total number of employees were 428, which corresponds to a 156 percent increase compared to 2010.

The development in full-time equivalents (FTEs) displays a similar trend over the same period. This implies that the average time employees spend working within Research for Innovation has been relatively steady over the years. Between 2010-2019, the average has varied between 0.38 – 0.46 FTE per employee.

Figure 8.14: Development in full-time staff and full time equivalents: FFI

Source: Halmstad University (2020)
Development in personnel

Concentrating the analysis to the development in time spent on research, Figure 8.15 shows that both FTE spent on research and share of all hours worked within FFI spent on research has varied significantly during the period.

Similar to the development in total number of employees, total hours spent on research and the average time spent on research peaked in 2017, when 90 FTE, corresponding to 44 pct. of the centre’s total working hours were spent on research.

Although the share of all working hours spent on research was 37 pct. in both 2012 and 2019, the share corresponded to 51 FTE in 2012 and 61 FTE in 2019 indicating an overall increase in total time spent on research within FFI in the period studied.
Development in personnel

FFI saw an increase in number of doctoral students over the first half of the period. The number of doctoral students almost doubled from 44 in 2010 to 83 students in 2015. Conversely, from 2015 to 2018, the number of doctoral students decreased. In 2018 and 2019 there were only 51 doctoral students within the research centre. This corresponds to a total increase of about 15 pct. over the entire period.

While the number of doctoral students has varied over the period, there has been an overall positive development in the centre doctoral degrees awarded at FFI. In 2012 only three were awarded. This number has risen to 13 in 2019. Meanwhile, the number of licentiate degrees has remained relatively stable over the later half of the period with three to four degrees per year.
Choice and mix of programme types

FFI has utilised 14 different programme types over the 10-year period. The programme types have varied depending on the timing of implementation. Until 2015, the Knowledge and Competence Centre primarily realised programmes targeting development of research areas and projects. Since then, FFI has also implemented programmes which target advanced in-demand education. Thus, indicating an expansion of focus from only research to both research and education. In relation to building a complete research and education environment, our impression on the basis of the numbers is that the centre has mainly used the KK-programmes to develop industry collaboration and to impact the balance between research and education.

The most common programme type within Research for Innovation is HÖG. This type makes up about 34 percent of the total number of implemented programmes during the period. The programme entails collaboration between researchers and industry partners with the objective to answer a delimited research question. The distribution of introduced HÖG programmes has been fairly consistent during the period with about 1 to 3 programmes implemented each year until 2018. Half-way through the period (2014), the number of HÖG projects peaked when eight new projects were introduced.

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Source: Halmstad University (2020)
Note: Initiatives are noted in the year they were started, not when they were applied for. The data for 2019 initiative is not available at the time of this evaluation.
Choice and mix of programme types

The second most common programme type within FFI is international guest professors (IGP), in which international guest professors are co-financed by the Knowledge Foundation. In total, 20 programmes of this category have been realised at FFI. In comparison to the HÖG programmes, the first IGP programmes were not introduced until 2013. The number of IGPs are distributed evenly over the subsequent years with the exception of 2017 when the Knowledge and Competence Centre had 7 new international guest professors. Since then, the centre has decreased the number of new IGPs. Together, the HÖG programmes and IGPs make up 61% of all of FFI’s implemented efforts. This implies that the majority of projects realised within FFI have targeted the development of new research areas and groups, strengthening the university’s capacity for research, expanding the university’s international connections and renewing Halmstad University’s research.

During the first years, the Knowledge and Competence Centre initiated, in addition the HÖG and IGP programmes; a research profile, a research profile ‘plus’, a company research school and a prospect. These are, similar to HÖG projects, programmes where university and industry partners collaborate on developing research areas and projects. It was not until 2015 that FFI started to realise efforts that focused on the development of educational programmes. Since then, FFI has introduced programmes such as AVANS, Expert competence, IT in higher education and NU. These programmes entail the development of advanced in-demand education (i.e. AVANS and Expert competence) as well as national and international (i.e. NU) profiling and positioning of the university. This development indicates an expansion from an initial focus on developing research, industry collaboration and positioning Halmstad University’s research to also include development of advanced in-demand education and positioning the university as educational institution.

Considering the realised efforts with respect to the aspects of building a complete environment, Halmstad University has developed most of its efforts in the context of two dimensions. The first is the balance between research and education, a topic which we will be discussed further, and the second is the cooperation with industry partners. The overview of these efforts shows that about half of the implemented efforts (HÖG, Prospect, Synergy and Forskningsprofil) consist of developing research in collaboration with industry partners.
Strategic and organisational abilities
Strategic and organisational abilities

It is clear from the analysis that the Knowledge and Competence Centre programme and the development of FFI has been used as a strategic tool to support the overall development of Halmstad University in line with the university’s overarching goals. The Knowledge and Competence Centre has thus been used as a mean to support certain developments, including the integration of research activities and to form a closer link between research and education. It is also clear that the leadership of the university has acknowledged the strategic value of developing the Knowledge and Competence Centre and has supported the implementation of the different strategies.

Overall, the strategic work in the Knowledge and Competence Centre have been allocated to different strategic levels. The sub-environments have had the primary responsibility for developing research proposals and other strategic initiatives. External input has in later years been gathered through workshops with external participants.

Meanwhile, the assessment and coordination of the strategies developed have been done on a higher level, by for example, the management team, programme manager and the advisory board. The final decisions and approvals have been made by the vice-chancellor of Halmstad University who, together with the programme manager, has also held the strategic and overarching responsibility for FFI throughout the period. Several adjustments have been made to strengthen the management structures within FFI during the period. The adjustments have aimed to increase the involvement of industry in the development of efforts, or have been targeted the strengthening the Knowledge and Competence Centre’s strategic role for the university.

In 2010, the three sub-environments CIEL, EIS and CVHI have developed individual strategies for co-production, research areas to develop, positioning of the centre, attracting other researchers, and how the centre was to contribute to progress in collaboration with the other environments.

The overarching work between the three environments was coordinated by FFI’s management team. The management has been responsible for matters related to the objectives, guidelines and regulations of FFI and reported regularly to the vice-chancellor. For support, the management team has relied on an advisory board with the task to advice on the development of goals and strategies for Halmstad University and to advise the management team on promoting further development.
Strategic and organisational abilities

During 2012, the structure outlined above was further developed with the purpose to clarify FFI’s strategic role vis-à-vis the university and to improve the coordination and management. The development entailed the introduction of a programme manager, a management council and a management team. The programme manager, directly subordinate to the vice-chancellor, was responsible for the strategic development of FFI and led the Knowledge and Competence Centre’s management team, which was responsible for the overarching work between the research environments. The management council was to be a supportive and advisory council for the vice-chancellor. An advisory board with external representation had the role to; (i) advise both the principal and the management team on topics such as strategic co-production; and (ii) serve as a platform for the industry to influence the strategic orientation within FFI. The advisory board also started to advise the vice-chancellor in addition to the management team.

A major event in the development of FFI was the disapproval of its work plan 5 (VP2016) in 2015. This led to major changes in the overall working methods and governance of the centre. The reasons for not approving the working plan were several, and largely reflected a criticism from the Knowledge Foundation’s expert group in how the centre was living up to the aim of better integrating the separate schools. Further critique from the Knowledge Foundation focused on the lacking ability to show a strategic direction for the university. As a result, the work was structured around the two overarching profile areas of Health Innovation and Smart Cities and Communities.

As a result of the critique from the Knowledge Foundation in 2015, work plan 5 (WP5) was revised, and several changes in the management structure were implemented. One important step was to involve the deans for the three schools more closely in the strategic decision making of the Knowledge and Competence Centre, thus allowing for more integration between the different schools.

Further changes that were included in the reworked VP2016 was an increased focus on developing new proposals in collaboration with partner companies. As a result of the alterations in the process, the management of the research centre and the advisory board was reorganized to include competencies matching the overarching profile areas. The process took several years, and by 2019, advisory boards were in place for both of the profile areas.
Strategic and organisational abilities

Besides the development of formal structures, FFI has to a large degree been characterised by a soft and informal management approach. This is manifested through the collaborative approach that is taken to several aspects of strategic decision making. Workshops are for instance common within the Knowledge and Competence Centre and are used to include perspectives from different interest groups such as researchers and partner companies.

Halmstad University is a small university where the personnel have close and long ties to each other. The governance of the centre is characterised by a rather informal organisation, but rather strong informal authority and steering. As described during interviews, a problem can be handled through a phone call rather than going through the formal procedures. This fits well with an overall impression of dynamism in the management of FFI. At the same time, this approach has downsides as the management structure is not always clear. Interviewees have pointed out that the centre’s management structure is sometimes challenging to understand for new staff and people outside the centre.

Has the Knowledge and Competence Centre programme impacted the ability to develop an organisation and management which supports the implementation of formulated strategies for all of Research for Innovation – FFI? Where 1 corresponds to no impact and 5 corresponds to a significant impact

Source: Damvad Analytics (2020)
Strengthening quality assurance
Strengthening quality assurance

The development of the quality assurance system for FFI was initiated already in conjunction with the application to becoming a Knowledge and Competence Centre. Staff in the centre consider the quality assurance system an overall success. Among the positive effects of the quality assurance system, is a significant change in the attitudes towards how research proposals are assessed.

In 2011, the sub-environments had individual quality assurance systems which were primarily used to develop already approved initial proposals into fully developed proposals. Meanwhile, EKS (the unit for contacts and collaboration) arranged activities for all research centres to improve quality. A faculty board reviewed the fully developed proposals which had been approved by the vice-chancellor in a second review by the advisory group and the vice-chancellor. The faculty board was responsible for the quality review process which was carried out by external international and national experts. The results served as a basis for the faculty boards’ recommendations for the funding of efforts.

Since then, the Knowledge and Competence Centre has altered its quality assurance system on several occasions. In 2012, FFI addressed the challenge of conflicting interests by introducing an evaluation group. The evaluation group’s role was independent from the university and was tasked with selecting experts as well as evaluating and compiling expert opinions.

An important alteration of the quality assurance system also occurred in 2013, when the university introduced the research and education board FUN (Forsknings- och utbildningsnämnden), replacing the faculty board in the centre’s quality assurance system. As a result, issues related to both research and education were handled by the same group.

The work of FUN has been at the centre of strengthening the quality assurance system. FUN has the responsibility for quality assurance and evaluation of research and education at the undergraduate and graduate level for the entire university. In terms of working methods, the Knowledge and Competence Centre has both introduced new structures while also being impacted by re-organisations at the university as a whole. This development, along with the challenges that the centre has met, are presented in the following.
Strengthening quality assurance

Although FUN has university wide responsibilities with regard to both education and research matters, the responsibility for quality assurance is limited to FFI. For the rest of the university, outside FFI, FUN was responsible for securing the connection between research and education as well as the long-term strategic priorities for research and education. Conversely, FUN has not been part of any strategic work for the Knowledge and Competence Centre. FUN was thus responsible for the compilation of evaluations from experts for each project and the weighing between scientific and co-production quality. The weighing is considered to have been made equally. In addition, EKS was reconstructed to ESS (the unit of strategic support) during 2013.

In 2014, smaller adjustments were made to the system, including new templates for quality assessment and recruitments strengthening the structure in place. The system is at this point in time described as "mature" and "stable", and an attempt was made to apply the system to other types of applications at Halmstad University. Although the ambition of expanding the system remains, no other attempts have been made since.

During 2015, a new overarching quality assurance system was developed to bind external and internal evaluations together. The new system was implemented during 2016 while it was also decided that as of 2016 all future suggestions for efforts were to be developed in workshops with partner companies. This was done in order to define challenges and interests within the scope of the two profile areas; Health Innovation and Smart Cities and Communities. This change also led to further re-organisation. As of 2017, there have been no larger changes to the system. From the vice-chancellor’s perspective the quality of grant applications and reporting had continued to increase in the later years.

These outlined adjustments of the quality assurance system have led to a system where proposals are evaluated from the idea stage and throughout the process of becoming fully developed proposals. This contrasts with the old system where the evaluation was delimited to fully developed proposals, a change which has been labelled important in interviews and our workshop with participants. The development in the quality assurance system has also led to changes in attitudes and working culture within the research profile. For example, it has resulted in an attitude where it is conventional to assess the research of others and to put the development of research projects in relation to the development of the entire university rather than just individual researchers or research groups.
Strengthening quality assurance

Although the development of the quality assurance system is considered to have been over overall successful, the system utilising external experts to reviewing the proposals have met some challenges. It has from time to time been problematic to find experts with the right competence to evaluate proposals. This has been particularly the case regarding collaborative projects with industry. One reason given in interviews is that few people in academia have sufficient experience and understanding to assess co-production quality.

In addition, the long process from idea until the start of a project, resulting from the increased focus on quality assurance, has been described as challenge when collaborating with companies. It can be difficult for researchers to keep up the companies’ interest for the projects while they wait for the project to start. Also, the introduction of the quality assurance system has entailed a challenge for researchers when the system potentially is rejecting their projects. This is described to have resulted in occasional discussions and tensions among the participating researchers.

In terms of ensuring academic development, FFI does not have a single system for ensuring the centre’s progress. Matters concerning this are in addition to the management group for the Knowledge and Competence Centre, handled by the individual schools’ management groups and groups within the research centres. Meanwhile, educational programmes have been subject to follow up through annual evaluations. During 2019, Halmstad University used external parties to conduct their own evaluation of master and bachelor level education.

Has the Knowledge and Competence Centre programme impacted the ability to integrate and document working methods and processes in a quality assurance system for Research for Innovation? Where 1 corresponds to no impact and 5 corresponds to a significant impact.

Source: Damvad Analytics (2020)
Strengthening academic profiling
Strengthening academic profiling

It is our overall impression across the evaluation results that FFI has played a central role in the profiling of Halmstad University over the last decade. Halmstad University has from the onset recognised the strategic importance of the Knowledge and Competence Centre as a profiling tool. Further, the quantitative indicators as well as participants in interviews and workshops show that the centre has developed in its abilities to attract research personnel and external financing.

Since the beginning, the Knowledge and Competence Centre has been viewed as a tool to continue an already ongoing strategic plan to profile the university towards innovation and entrepreneurship and change the balance between research and education.

Regarding the profiling of the university, the centre realised KK-programmes (HÖG-projects, Prospects, research profiles and strategic recruitments in the form of international guest professors (IGPs) or deputy vice chancellors) to build up the research centre’s research and connections to industry, and international research. Hence the realised efforts built up a base for profiled research and educational centres. An approach which has been described as particularly important is IGPs, since they introduced new ways of thinking, strengthened research at the university while contributing with their international networks.

An important event for the development of the academic profiling ability at Halmstad University over the 10-year period was the scientific review, ARC13, conducted in 2013. Recommendations made in the review included increasing research funding to strengthen research, establish advisory boards with external experts, concentrating the focus to fewer research questions, improve publication strategies and making co-productions and collaborations more visible.

Several of these recommendations were realised during the following years. For instance, the university introduced a training for research leaders which is described to have played a central role in developing the quality of research at Halmstad University and FFI.
Strengthening academic profiling

An additional indicator of FFI’s increasing academic profiling ability is the Knowledge and Competence Centre’s ability to attract scientific personnel. The Knowledge and Competence Centre has had an overall positive development in number of employees and full-time equivalents. During workshops, the ability of attracting research personnel has been listed as one of the greatest impacts of the Knowledge and Competence Centre programme. During interviews, representatives of the research profile describe a two-sided ability to attract personnel depending on position. The representatives consider themselves successful in the recruitment of some personnel while some positions have been more difficult. As a positive example, IGPs are lifted. In terms of utilising KK-programmes to attract research personnel, the centre has for example realised 4 Prospects. These entail the possibility for newly graduated researchers to independently run research projects in cooperation with industry partners.

The centre has actively recruited guest professors and this work is seen to have had many positive effects on the development of the academic profiling ability. Guest professors have contributed with new ideas to the university and have given a more international perspective on the research at the university. This in combination with other initiatives has contributed towards establishing a stronger performance culture at the university which again has had an impact on the academic profiling ability at Halmstad University. Finally, participants state, in interviews and our workshop, that they have experienced a large impact on the Knowledge and Competence Centre’s ability to attract external funding. This is in line with the numbers for the last decade, presented in previous sections, which displayed a strong overall increase in funding from public financiers, own grants and private financiers.

Has the Knowledge and Competence Centre programme impacted the ability to scientifically profile Halmstad University as a whole? Where 1 corresponds to no impact and 5 corresponds to a significant impact.

Source: Damvad Analytics (2020)
Balancing and integrating research and education
Balancing and integrating research and education

FFI has, as a relatively big component of the university, had a significant impact on the balance and integration of research and education at Halmstad University. Over the 10-year period, the management has focused systematically on increasing and developing the volume and quality of the research conducted at the university. It is also our impression that the Knowledge and Competence Centre has resulted in a stronger integration between research and education priorities. This has been targeted through the development of “complete chains” of education as well as integration of research into education. In the following, we describe the most important actions during the 10-year period.

At the start of FFI, Halmstad was a small university with a large volume of education relative its more limited research capacity. Reviews by UKÄ showed serious challenges with low quality in several of the programmes. The university was also challenged with a weak link between research and education. Halmstad University was quick in acknowledging these challenges.

In 2012, an ambition was formulated to alter the ratio between wage costs for education and research from 7:3 to 6:4. In line with this ambition, FFI has both utilised different programmes available to Knowledge and Competence Centres while the university as a whole took steps to reduce its educational supply.

During the first five years, the Knowledge and Competence Centre exclusively realised Knowledge Foundation financed programmes designed to develop new research areas and groups, increase the university’s research capacity and expand the university’s research network.

Simultaneously, although not as a result of FFI, Halmstad University made a large reduction in educational programmes. Between 2013 to 2015, the number of educational programmes were hence reduced from 103 to 62 programmes. These changes was not a direct result of the Knowledge and Competence Centre, but played along the lines of the strategy devised for both the university and the centre.

In terms of degrees on advanced level, the number of masters’ degrees has not seen a clear development over the period. In 2014 the highest number of students, 255, obtained a master’s degree (4- and 5-year master’s degree combined) at FFI. In 2017 the number was significantly lower when only 111 students graduates with a master’s degree.
Balancing and integrating research and education

After 2015, the focus expanded from focusing on developing research towards also developing new educational programmes to create a complete environment. This was done through; (i) integrating research in education; and (ii) an increase in advanced level education. In conjunction with this, FFI started to utilise new types of KK-programmes that encompassed development of advanced education in collaboration with industry to meet labour market demands and providing online education. Further, postgraduate education programmes were developed within successful research areas with the ambition to provide a “complete chain of education” – from bachelor level to postgraduate. This is an ongoing work which entails a further reduction of educational programmes in order to reach fewer and stronger programmes.

The interaction between research and education takes place through channels while also varying over time. A prominent example of the integration efforts is that Halmstad University does not start new educational programmes unless the University has research within the programmes' specific area. Another example is that of interaction through teaching personnel also conducting research and the involvement of advanced level students in research. Within CVHI, researchers have also been involved in the development of new courses adjusted to the university’s profile. In addition, programme heads now have PhD degrees.

Has the Knowledge and Competence Centre programme impacted the ability to scientifically profile Halmstad University as a whole? Where 1 corresponds to no impact and 5 corresponds to a significant impact.

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Source: Damvad Analytics (2020)
Collaboration with external partners
Collaboration with external partners

FFI has collaborated with many different external partners such as firms, science parks, universities, hospitals and regions over the 10-year period. The forms of cooperation have varied between agreements of the entire Knowledge and Competence Centre, cooperation with science parks and the individual researchers ties with external partners. Since the Knowledge and Competence Centre encompasses different research areas the collaborations have differed within the profile.

During the first years, FFI was closely connected to the Science Park Halmstad AB. The collaboration with the municipalities in Halland and the local business community was thought to have the potential to create an intersection of research, education and innovation. However, Halmstad University left the collaboration at the turn of year 2015/2016. According to representatives of the university and the Knowledge and Competence Centre, the main reason for leaving the science park was due to the limited focus on commercialising research from the university and to a higher degree focus on general entrepreneurship in the region. Thus, it was acknowledged that the collaboration brought limited added value to the University and the Knowledge and Competence Centre’s development.

In terms of more strategic industrial collaboration partners, two companies in particular have been highlighted in the interviews. The first one is Volvo AB. The Knowledge and Competence Centre had collaborated with Volvo throughout the period in which the volume of projects increased. The second highlighted collaboration is a long-term strategic agreement with Stena Recycling.

Region Halland has also been mentioned as an important collaboration partner for FFI’s industrial collaboration partners. Parts of the Knowledge and Competence Centre and the university have also engaged in national collaboration platforms and strategic programmes. CAISR is part of the national collaboration platform on AI innovation of Sweden.

Meanwhile, Halmstad University is part of two strategic work programmes; SIP Drive Sweden and SIP Viable Cities. The roles of those concerned with collaborations have fluctuated depending on the type of collaboration partner. When the focus is on research, the main driver and source of initiating a collaboration is individual researchers reaching out and establishing collaborations.
Collaboration with external partners

In a self-evaluation, Halmstad University ranked their achievements in collaboration with external parties to a score of four out of five. The assessment was largely based on surveys sent to external partners where the responding partners ranked the university as a good and appreciated collaboration partner.

Representatives from FFI have mentioned several challenges with respect to collaborations in interviews. One challenge described is the limited availability of funding for collaboration with public sector actors. As a result of the gradual transition of the Swedish public sector, a growing number of enterprises can be described as semi-public. It is unclear from the university’s perspective to what degree the Knowledge and Competence Centre can use its funding in such collaborations.

Another issue which has been raised repeatedly by representatives of the KK-centre, both in our interviews, as well as in several reviews and reports included in the literature study, is the lack of suitable collaboration partners in the local private sector. Particularly, university representatives point to that large technology firms tend to be the most important private sector partners at Swedish universities, and that such firms are largely lacking in the local economy.

This description has some support when assessing the overall structure of the local economy. This weakness has been addressed in several work plans, with suggested actions points, however from interviews with representatives, the issue seems to remain. Also, the fact that the requirement of collaborating firms co-financing half of the research projects has made the inclusion of smaller companies in research projects more difficult.

Challenges have differed between the sub research centres. In the research centre CVHI, one such challenge has been the general perception among the centres’ researchers that research should be independent from the medical industry. In addition to this, researchers have not felt included in the two overarching profiles. Although progress has been made regarding the inclusion of CVHI researchers in the profile Health innovation, these researchers are still struggling with finding their role in relation to Smart Cities and Communities.
Collaboration with external partners

Although Research for Innovation has met the challenges outlined above there has been an important development in the collaboration ability in recent years which can ascribed specifically to the Knowledge and Competence Centre programme.

FFI researchers have become much more sensitive to companies’ needs. In CVHI, there has been a change in attitude towards working with medical companies while the centre has also hired a health economist as a response to market demands. In addition, the Knowledge and Competence Centre has attempted to work with clusters of companies to address the issue of companies not having sufficient funds to co-finance an entire research project.

A future strategy for improving the ability of co-production include continuing already initiated collaborations instead of ending the collaborations after ending a project. Another mentioned ambition during conversations with representatives for the Knowledge and Competence Centre is that of a more national approach to deal with the limitations of the local private sector. The regional borders are no longer to the same extent seen as a limitation for building collaborations with external partners.

Has the Knowledge and Competence Centre programme impacted the ability to develop collaboration strategies for Research for Innovation together with companies and/or other external actors? Where 1 corresponds to no impact and 5 corresponds to a significant impact.

Source: Damvad Analytics (2020)
9. Appendix – Methodology
Methodology

A team of analysts from DAMVAD Analytics has evaluated the Knowledge and Competence Centre programme, and analysed the 10-year development journey of the three Knowledge and Competence Centres by a multitude of methods, including quantitative data analysis, interviews, questionnaire surveys, document studies, workshops and bibliometric analysis. The evaluation has been conducted from May to December 2020 and has involved more than 100 representatives and partners connected to the three Knowledge and Competence Centres.

Document studies
This methodological element involves collecting and analysing available literature received by the Knowledge Foundation, respective Knowledge and Competence Centre and host university as well as other relevant written sources. Up to 900 relevant documents, 300 documents for each Knowledge and Competence Centres 10-year development journey were made available at the beginning of the evaluation. These were complemented by several other documents during the evaluation period. The purpose of the document studies have primarily been to identify important decisions, plans and events and ensure that the evaluation builds on all knowledge available.

The Knowledge and Competence Centres have willingly provided all workplans and progress reports released throughout the 10-year period. They have also provided internal documents such as instructions of quality assurance systems, meeting notes, workshop materials, and work plans for the universities. The Knowledge Foundation has given us access to all documents sent between the host universities and the Knowledge Foundation concerning the Knowledge and Competence Centres. Documents also include funding decisions, internal evaluations, project applications, and correspondence between the foundation and the universities.

Data analysis
The Knowledge Foundation and the host universities have also provided raw data describing the personnel, the financing and programme mix within the Knowledge and Competence Centres. The personnel data describes the development in personnel, both in number of persons and in full time equivalents. Further, the data shows the development per personnel category. The financial data describes internal and external funding that the Knowledge and Competence Centres have been granted. Lastly, the KK-project data provides information about which specific KK-projects the Knowledge and Competence Centre have been awarded, and during which time period they have utilised the projects.
Methodology

Bibliometric analysis
The bibliometric analysis is intended to assess the quality of the scientific production of the Knowledge and Competence Centres. All three Knowledge and Competence Centres have provided publication lists. From the publication lists, we were able to identify a total of 1,312 (52% pct.) peer-reviewed publications from Research for Innovation (FFI), 1,094 (71% pct.) peer-reviewed publications from INFINIT, and 1,085 (71% pct.) peer-reviewed publications from Transformative Technologies (TransTech).

Publication volume measures the number of publications per Knowledge and Competence Centre. International and industry co-publication examines the organisational affiliations of authors to publications affiliated with the Knowledge and Competence Centres. By classifying the organisational affiliations to be either national or international, we identify which articles have been published in collaboration with international research institutions or companies.

Scientific impact refers to the impact of an article in the scientific community. The impact is derived from the number of citations for publications authored by researchers from the Knowledge and Competence Centres. The estimated impact is based on the field normalised mean citation score.

The field normalised mean citation score used in the analysis is state-of-the-art when it comes to citation analysis. The indicator considers differences in publication patterns for different scientific fields, publication types, and publication year. As an extra precaution to avoid overestimating the citation counts, we exclude self-citations, i.e. authors citing their own work. The calculation of the normalised mean citation score is based on the period from 2011 to 2020. Finally, we calculate the normalised mean score relative to three different benchmarks: Sweden, the Nordic countries, and the OECD countries.

Qualitative interviews
Near to 100 meetings and interview sessions have been conducted throughout the evaluation period with key persons affiliated with each of the Knowledge and Competence Centres. The interviewees involve vice-chancellors, programme managers, steering group members, research leaders and researchers. In addition, five members from the Knowledge Foundation’s expert group have been interviewed. The interviews and meetings have been conducted in three interview rounds. The first round was more explorative. The second and third rounds focused on specific questions that we needed to discuss, test and nuance, or simply needed more concrete information.
Methodology

The interviews ranged between 60-90 minutes and followed semi-structured interview guides. The questions in the interview guides differed depending on the interviewee's role within or around the Knowledge and Competence Centres. Throughout the evaluation, we have had a continuous correspondence with the centre’s management groups and thus been able to nuance and/or clarify our conclusions through several bilateral meetings. The evaluation has very much been an involving endeavor which has only been possible through the very active and positive participation of all involved, including the centres, the host universities and the responsible persons in the Swedish Knowledge Foundation.

Questionnaire Survey
A questionnaire survey was sent to a total of 99 respondents identified by each Knowledge and Competence Centre as having been deeply involved in the Knowledge and Competence Centres development, including selected external collaboration partners. The survey was launched in the period 21-09-2020 to 02-10-2020. Within this period, three reminders were sent to secure a high response rate. 93 respondents answered the survey, which gives a response rate of 94 pct. 19 respondents are identified as an industry partner while the remaining 74 respondents are affiliated with a university. The survey results served as inspiration for the workshops.

Digital workshops at three universities
Three workshops (one for each centre have been held in the autumn of 2020. The workshops have been online due to the Corona pandemic. The online workshops took place on October 6th (Transformative Technologies), 7th (INFINIT), and 8th (Research for Innovation). In total, the workshops were attended by 70 participants identified by respective Knowledge and Competence Centres. Both participants from academia and industry participated. The workshops lasted 2,5 hours. The workshops were each orchestrated by four evaluators from DAMVAD Analytics.

During the workshops, DAMVAD Analytics presented the initial findings, including the timeline over centre period and survey results. The participants were split into four different breakout session groups and discussed the following questions: i) Where have you experienced the biggest impact?, ii) What hasn’t changed (very much)?, iii) Are the changes viable – why/not?, iv) Select up to 3 challenges?, v) Describe possible solution?, and vi) How would it work? After the breakout sessions each group presented their answers and discussions continued in plenum. The insights from the workshops provided numerous perspectives on the key results that have been included in the final report.
10. Appendix 2 – Bibliometric index
TransTech

Figure A1: Development of the Swedish Research Council’s bibliometric index for four core research areas for TransTech

- Chemistry
- Computer Science
- Engineering
- Materials Science
Figure A2: Development of the Swedish Research Council's bibliometric index for four core research areas for INFINIT
Figure A3: Development of the Swedish Research Council’s bibliometric index for four core research areas for FFI
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This report contains the results of the evaluation of the Knowledge and Competence Centre programme (KK-miljöprogrammet) and the 10-year development (2010-2020) journey of the three Knowledge and Competence Centres (KK-miljöer) at Halmstad University Research for Innovation, Mid Sweden University TransTech and University of Skövde INFINIT.

The purpose of the evaluation is:
1) To provide insight into the goal fulfilment of the Knowledge and Competence Centre programme, including the effectiveness of its implementation.
2) To analyse the 10-year development journey of the three Knowledge and Competence Centres.
3) To deliver recommendations for the possible adaptation and amendment for further development of the programme.