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LIFE CYCLE
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Life cycle competence needs, current and future, in the Swedish industry sector

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Authors: Marie-Louise Lagerstedt Eidrup, Sara Palander, Greg Peters
Layout: Technical secretariat, Swedish Life Cycle Center (Chalmers University of Technology)
Contact: lifecyclecenter@chalmers.se

Summary

This study, funded by Adlerbertska Foundations, was made to understand the competences that industry and society demand and will require to be able to handle internal and external claims on life cycle information. Further, the objective was to describe the possibilities that life cycle competences provide in order for the companies to handle large complex systemic changes that will be needed to increase the company's competitiveness whilst handling the conversions to a circular economy, energy transition and a more sustainable consumption and production system. Data has been collected via interviews, a survey, and group discussions and thereafter interpreted, translated, and clustered under headlines describing the overall theme of the data.

The conclusion from the study is that competence will be required on all levels in companies, but the level of knowledge required varies depending on function and the role. It could also be beneficial to create new official roles that guard the transition of the strategy in the company and secures compliance.

The education needs to be customised and adapted to the need of different functions and industry sectors. There is also a general need to raise the awareness of the life cycle perspective in society at large, so there should be mandatory life cycle sections in all educations. Academia, being neutral and a hub for knowledge building, is expected to continue drive the development of technology and methods to ensure the availability of competence and skills in the future.

Contents

Project information

Project title

Mapping the need for future life cycle competence among Swedish industrial companies.

Funded by

Adlerbertska Foundations

Aim

The aim of the project is two-fold. Firstly, to understand the competences that industry and society demand and will require to be able to handle internal and external claims on life cycle information. Secondly, to describe the possibilities that life cycle competences provide in order for the companies to handle large complex systemic changes that will be needed to increase the company's competitiveness whilst handling the conversions to a circular economy, energy transition and a more sustainable consumption and production system. With the study we also intend to inspire companies that do not yet apply or understand the life cycle perspective in their work, to see the opportunities by incorporating a life cycle perspective into their processes.

Project manager

Marie -Louise Lagerstedt Eidrup

Coordination of the project

The project has been coordinated by Swedish Life Cycle Center, a national center of excellence for the advance of credible and applied life cycle thinking in industry and other parts of society.

Project management team

Sara Palander, Marie-Louise Lagerstedt Eidrup, Greg Peters

Time period

2021-11-01 – 2022-03-31

Acknowledgements

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About Swedish Life Cycle Center

Swedish Life Cycle Center is a collaboration platform for universities, industries, research institutes and government agencies for competence building and the exchange of experience to move the life cycle field forward. Current partners are Chalmers University of Technology (host of the center), KTH Royal Institute of Technology, Swedish University of Agricultural Sciences, Swedish Environmental Protection Agency, Electrolux, Essity, Polestar, Vattenfall, Volvo Car Group, Volvo Group, IVL Swedish Environmental Research Institute, RISE Research Institutes of Sweden, Scania and CEVT. The Center hosts a dialogue group with nine Government agencies in Sweden. For more information about Swedish Life Cycle Center, please visit www.lifecyclecenter.se.

1. Background

To address the societal challenges of resource depletion and climate change due to un-sustainable production and consumption, major reforms that will accelerate the transformation to a circular economy are needed. This requires a holistic perspective gained by *life cycle thinking*. By that we mean thinking about the environmental, social, and economical aspects of products and processes for production and consumption from cradle to grave - from raw material acquisition to the end of life and next life of a product, via the production and use phases. It incorporates a range of approaches from simple qualitative analyses to more complex life cycle assessments. Life cycle thinking enables a person to have a *life cycle perspective*, creating a sound foundation for decisions and avoiding burden shifting to other parts of the value chain or from one environmental impact to another.

The benefits of a life cycle perspective have been demonstrated in both industry and public policy making. For one thing, it enables the identification of where the major potential for improvements and actions for efficiency are located (Swedish Life Cycle Center, 2022a). In particular, earlier mapping of real product development processes exhibited the benefit with a life cycle perspective upon selection of technical solutions, budget priorities and in communication with markets and customers (Sandin et al. 2014).

"The life cycle approach highlights the bigger picture of environmental impact and can act as a great starting point for identifying and improving on environmental hotspots in the manufacturing industry."

(Thinkstep anz)

As early as 2003, the European Union stated that "Life cycle assessment provides the best framework for assessing the potential environmental impacts of products currently available" (European Union, 2003). Today, life cycle assessment and life cycle thinking are being integrated in product policy development and in development of legislation, e.g., when defining problems and identify policy options or important policy initiatives.

The evolution of the implementation of life cycle thinking in policies and communications within the European Union could be seen from the early nineties in regulations of Ecolabels (1992), and in the packaging directive (1994). In the last decade the Communications, such as the Resource efficiency flagship (2011), EU Green Deal (2019), Circular Economy Action Plan (2020) have been introduced on the European market (Sala et al. 2021 and European Commission, 2021). Since the EU Communication Single Market for Green Products in 2013, when the Product Environmental Footprint and Organisation Environmental Footprint (PEF and OEF) were communicated, the interest in life cycle thinking and life cycle assessment have increased significantly. PEF and OEF are life cycle assessment-based methods to measure and communicate the potential life cycle environmental impact of products (goods or services) and organisations, respectively (European Commission, 2021). These methods are now being used in policy development and in legislation.

"Requirements and expectations for communicating environmental performance of products and services are increasing"

Swedish Life Cycle Center, 2022b

The aim of this project was two-fold. Firstly, to map and understand the competences that industry and society demands to respond to internal and external requirements for life cycle information. Secondly, to describe the possibilities that life cycle competence provides regarding handling of complex, systemic changes needed to increase competitiveness while transforming into circular economy, sustainable energy systems and a sustainable consumption and production system.

The overall ambition was not only to identify current competence needs, but also to increase the understanding of the need for complementary roles in organisations - roles that are needed now or will be, in order to implement the changes necessary for a sustainable future. The outcome of this project is also to inspire companies, that are not yet practicing life cycle thinking in their work, to see the opportunities by incorporating a life cycle perspective into their processes.

2. Method, data collection and analysis

Information regarding how both research and industry in Sweden experience the need for Life Cycle competence was collected by performing several comprehensive interviews with representatives from academia, research institutes and sustainability/environmental departments within industrial organisations. The industries selected are high profile companies with well-established and integrated life cycle thinking processes in their organisations. The academics interviewed conduct research in the field of how life cycle assessment impacts decisions in organisations based on how it is transferred between functions and perceived by the receivers.

The focus of the interviews was to get an understanding of the following three aspects: (1) how the interviewees perceived that a life cycle perspective impacts the industrial organisations. (2) what competences they see are needed to sustain current work, and (3) what skills might be requested in the future. Questions used in the interviews are collected in Appendix 1, however, the questions were used to support open-ended dialogue during the interviews rather than being a structural constraint, therefore all questions were not asked in every interview and the dialogue was modified depending on the replies given.

The insight from the interviews was used as input and a starting point to form a short survey. The survey contained nine open questions, see Appendix 2, and it was sent to a larger group of Swedish industrial companies. The companies receiving the survey represent a variety of industry sectors. The intention of the open questions was to allow the respondents to write more explanatory answers, describing how a life cycle perspective is incorporated in their current work in their respective organisation and what complementary competencies they considered would be of value now and in the future.

The outcome from the interviews and the survey were presented in a webinar with a mixed auditorium with representatives from industry, academia and research institutes. Afterwards the audience were asked to participate in a group discussion to provide further input to the study. To lead the group discussion into dealing with competence needs four questions were provided, see Appendix 3. Notes from the respective groups was collected after the discussion.

3. Results

The results from the interviews, the survey and the group discussions in connection to the webinar have been interpreted, translated, and clustered under a few selected headlines. The headlines: Strategy, Enabler, Way-of-Working, Education, and Competence, have been selected based on the character of the answers. Some answers could have been organised under more than one headline but in this compilation of results only one have been selected. When interpretating the responses one can also argue that most of the replies are in their context connected to the need of competence within the field of life cycle thinking but sorted under the different headlines.

Strategy

The researchers interviewed were unified in their perception that conveying results from life cycle assessments often falters in organisations. This has, according to the researchers, a negative impact on the pace in which companies take actions that support the transition to circularity and climate neutrality. There is no single explanation behind this, but according to the researchers it is partly due to not having a life cycle perspective integrated into the company strategy nor broken down into understandable targets, i.e., there is a lack of understanding of what personal gains are to be made, or the potential impacts of individual departments or business functions on the overall sustainability goals.

According to the researchers, to successfully set relevant targets, it is of utmost importance to have an engaged upper management team but also to connect the financial control systems with a life cycle perspective, thus integrating strategic life cycle management throughout the whole organisation.

The driving force for the companies to strategically work towards a life cycle perspective is the willingness to contribute to a more sustainable industry, becoming climate neutral, and thereby creating a more sustainable society. The interviews with the industry representatives support the researchers' point that having life cycle perspectives well integrated in the strategy interpreted and broken down into comprehensive, relevant, and accepted department targets is a key factor for ensuring compliance. There were also similar comments as from the researchers that environmental and sustainability factors should be given financial values to clarify the impact.

The responses from the survey were consistent with expectations and only reinforced what had already emerged in the interviews. From the group discussion it was brought up that it is important to understand that an organisation's different targets can be contradictory, and that a well-anchored and prioritised strategy therefore is vital.

Enabler

A life cycle perspective was considered by all interviewees, survey respondents and participants in the group discussions to be an enabler, supporting breaking down of the strategy, responding and preparing for external communication and requirements and driving innovation. Moreover, it ensures keeping up to date with legislation, policies, and trends in the area.

The researchers highlighted a concern that when a life cycle perspective is not integrated in the strategy or fully understood as an enabler it becomes instead a checkpoint, a chore that needs to be done, instead of something that contributes to the development of products, processes, or services. Access to simple digital tools that could be used to illustrate the consequence of various alternatives in early development could prevent simple mistakes.

During the interviews with the industry representatives, it was also seen that a life cycle perspective could help with the provision of a systemic view of the company and the products thereby identifying hot spots in the value chain, thus clarifying actions needed to reduce impact. Further, a life cycle perspective is seen by the industry representatives as an inspiration for product innovation and process efficiency. Some interviewees also expressed interest in simple digital tools as enablers that could be used in early development but also by customers to compare different product alternatives.

The survey further strengthens the idea that a simple tool for early screening of alternatives could be of great value. It was also added that a life cycle perspective strengthens company brands and thereby the competitiveness of the company and that fact-based communication created from analyses made increases the credibility in the communication with authorities and customers.

Way-of-working

By using life cycle thinking, the company strategy can be broken down into relevant targets for respective department and business functions, but it also helps in understanding the value chain and impacts coming externally from outside the organisation.

The researchers emphasised the importance of translating data from life cycle assessments into information or recommendations that are relevant for the receiver in the organisation. The translation and communication are preferably done by someone who understands the driving force of the organisation and the receiver, someone who is not necessarily the analyst. The researchers saw the need for new roles or functions in companies to support the transition into a new strategy and to interpret and communicate data from analyses made. Firstly, there is a need for a *facilitator* - someone who supports in the process of turning the company strategy into understandable and relevant department targets. Then there is the translator and conveyor of data, the *communicator*. This role is held by someone who understands both the life cycle perspective and the business drivers, thus, having the ability to explain analyses data and convert them into recommendations.

The interviews with the industry representatives reinforced this picture: that providing data in such a way that it becomes comprehensible for the receiver is key. From the industry it is also clear that it is most efficient to work in cross functional, collaborative teams to ensure a common understanding of the product, the process, limitations, conflicts of interest, the value chain etc. thus, avoiding sub-optimisation and inefficient solutions. The industrial participants agreed with the researchers that there is a need both for a *facilitator* and a *communicator*. Further they see that it would be beneficial to have someone at each department/business function that has the function of continuously reminding others about targets and processes to be compliant with the strategy, calling such a person an “Angel”.

In the survey responses, collaboration between internal functions and along the value chain is also pointed out as key. Additionally, as a life cycle perspective is an enabler identifying the need for development, it is also seen as beneficial when brought in early in product or system development activities. Moreover, it is said that continuously reminding others about the targets ensures a better compliance within the organisation. The respondents further added the need for a role that have more specific knowledge derived from a life cycle perspective to guide others when selecting methods, system boundaries, and data for analyses. They also identify the importance of having a life cycle group and being not a single individual responsible for the function. A vital and strong external network, with other specialists, could compensate for the lack of colleagues. This corresponds to earlier testimonials from LCA specialist within industrial companies saying that the Swedish Life Cycle Center fulfils this function in the absence of sufficient critical mass within their companies. Another important aspect of external collaboration is for example with other companies within the same industry sector to strengthen the communication with authorities impacting formation of standards for example.

Group discussions complemented the picture by adding that external requirements for environmental or sustainability information are continuously increasing. To be able to respond to these increasing demands one needs to collect more data which further strengthens the necessity of collaboration along the value chain but also the need for common tools where data can be shared. The ability to respond to these external requirements and to guide the company towards lower environmental impact is important and there is a need for internal *life cycle champions* who have master-level specialist training in LCA and other approaches to life cycle thinking, and considerable practical experience of their deployment. The number of such champions or experts will vary considerably from organisation to organisation: one engineering construction company suggested that each group of 300 staff needs a *facilitator*, a *communicator* and a *champion*. The latter does not do all the life cycle thinking or life cycle assessment in the group but participates in it and ensures its quality.

In the group discussion, it was also mentioned that a more formal role and title could be used to emphasize this important work/competence and create even more legitimacy internally in decision making and management collaboration. E.g., in some companies a *Manager of Circularity* has been employed. For small- and medium sized companies the collaborative cross-functional team could be set up to start the discussion about the life cycle perspective and the dialogue about their products’ life cycle and their value chain.

Education

There is broad conception among participants in this study that more education on the life cycle perspective is needed in general and that it should be made mandatory in all educational programs. It is crucial to increase employees’ understanding of individual, product and company impacts and of the actions needed on all levels in society to reduce overall environmental impacts.

Life cycle experts often lack knowledge about business drivers and financial values, but instead of adding the expectation that this knowledge is obtained by the life cycle experts, it was seen by the researchers that it would be more effective if more people in the organisation had a broad knowledge of the life cycle perspective. However, there is also a need for providing educations that lead to deeper understanding of life cycle assessments, methodology, data, boundaries etc.

The industry participants supported the view that life cycle experts need more and deeper understanding of life cycle

assessment, how data is created and what setting the system boundaries means for the results achieved. However, besides providing a broad and general education prior to recruitment they see the benefit of internal education, supporting a common understanding of the company value chain, the product and processes thus enabling more collaboration. Other thoughts are to provide education directed towards a specific industry sector or towards specific functions like procurement, finance and sales.

In addition to the interviews, the same reflection on mandatory education for all, was apparent in the survey participant responses. Also, they see a further need to have internal cross-functional educations to aid in the common understanding of the company impact. Concern was expressed that building competence and awareness takes time.

Competence

It is clear from this study that there is a need for both broader and more specific competence in life cycle thinking to accelerate the transition to a more sustainable, circular, net zero industry.

Researchers like to further explore the need for broader knowledge among all functions and in the group discussion the importance to create the connection between financial values and life cycle perspectives to add a financial dimension to the perspective was discussed. According to the researchers, increased general competence is required also to be able to scrutinise and accept strategy targets.

Industry is also looking for specific competences to complement the internal current life cycle competence. Competences mentioned are mass balance systems and certificates, product knowledge, expertise on regulations and standards, chemistry and hazardous substances, materials, environment, circularity, resource depletion and energy use.

Survey respondents agreed with all interviewees, both researcher and industry, in that there is a need to increase the general level of life cycle understanding among employees while also adding expertise in certain areas to complement the life cycle experts. However, the survey indicates that academia has a responsibility to be in the forefront to further develop knowledge, to ensure unbiased, robust, and resilient methodologies and tools. Authorities, on the other hand, have the responsibility to create relevant legislation and thus also need to have high competence in life cycle thinking.

From the group discussion it was further stressed that only by a broader understanding of life cycle perspectives in all organisational functions, can a common language be created that secures relevant strategic actions with full compliance.

4. Discussion

This study was intended to collect information from both academia and industry regarding the need of competence within Life Cycle Perspective, both current and in the future. The results from interviews with researchers and industry experts and the survey respondents have been interpreted and concluded under headlines that describes different areas of impact. Even though a division under different headings have been made all answers are related to competence. The aim was to identify needs both current and, in the future, but from the answers it is clear that the focus for all respondents have been the near future, which can be interpreted as a sense of urgency, as building competence takes time.

To build common understanding of the company strategy among all employees is important. Now, when the general trend is to add and integrate life cycle targets to corporate strategy it becomes evident that for their successful implementation, the level of competence needs to increase in all functions of a company. The life cycle targets of the strategy also need to be translated and broken down to the departmental level in organisations to ensure relevant actions and compliance. Therefore, it is seen as important to add mandatory education on life cycle thinking for all, irrespective of education level or faculty. It is also beneficial to provide internal educations to increase the level of systemic understanding of the company, its products and impact on the environment and society and its role for accelerating sustainability work.

Today, requirements from authorities and customers on providing information connected to sustainability is continuously increasing. Integrating life cycle thinking, in both the corporate strategy and in daily operations, will enable the organisation to be prepared for these demands by being ahead with regulations, standards, and identification of hot-spots in the value chain. Further, life cycle thinking can be an important support and means to drive innovation and efficiency in the organisation.

To maintain momentum and compliance with the strategy, new professional functions like the *communicator* interpreting and conveying data into relevant recommendations, the *facilitator* supporting in understanding the strategy and actions needed, and the so called *angels* continuously reminding employees about the targets, could be important. Simultaneously, there seems to be a need for life cycle experts, *champions*, with deeper knowledge about methodologies, boundaries, and management and understanding of data. To further increase the general understanding of the life cycle perspective, education should be mandatory. However, to become relevant, education must be adapted to the level of education, faculty, function in question or the industry sector depending on if it is provided in schools or as internal education.

Besides the focus on larger companies, the SMEs are important and will be affected by both internal and external requirements on Life cycle information. Increased understanding of the life cycle perspective is therefore also needed within these companies, however due to limited resources within the SMEs support for their sustainability work from larger organisations, or from cross-sectoral associations, is crucial.

5. Conclusion

Building competence in life cycle thinking is a timely investment which is becoming more urgent as the requirements on companies to become more sustainable are increasing both from authorities, customers, and employees. However, building competence in life cycle thinking is not just a burden but it if truly integrated it can strengthen the organisational brand, improve the competitiveness, whilst also driving innovation and efficiency activities based on more informed decision making.

Competence will be required on all levels in the company, but the level of knowledge required varies depending on the function and the individual role. It could also be beneficial to create new official roles that guard the transition of the strategy in the company and secures compliance. Furtherly, by securing competence in all functions the ability to work in cross functional teams is increased, which hinders sub-optimisation.

To meet expectations on increased awareness and expertise in life cycle thinking, the conclusion is that all educational programs should contain mandatory components on life cycle thinking. Complimentary to this, post-graduate educations, directed towards specific functions or industry sectors will be demanded. Finally, by providing internal cross functional education, common understanding of the company its impact as well as understanding the value chain will contribute securing future success of the business.

Further, there is a need to develop the concept of life cycle perspective to include and be more integrated with business systems, customer interactions, and financial evaluation processes.

6. Recommendations

With increased expectation on all industry sectors to become more sustainable, the demand for life cycle competence and *life cycle champions* will continue to grow. Based on the development that companies experience, and what we have seen in this study, the demand for experts within life cycle will increase, both within companies that already have a well-established way of working with a life cycle perspective but perhaps even more so with companies that are about to commence their life cycle journey. Thus, there is a need to expand the number of students within the discipline of life cycle education to provide these future employees. Parallel to the life cycle experts there is a need for complementary expertise in the areas of materials, chemicals, process, environment etc. to support with knowledge and data required for analyses. These other experts will also need a certain level of life cycle competence to be able to provide relevant data and contribute to discussions on limitations for the analyses.

Further, there is a pronounced need for new roles, individuals with a strong driving force for life cycle questions other than life cycle champions (experts), Individuals who can translate analysis data into recommendations in line with the strategic targets and communicate this in the organisation, i.e.: *communicators.* Another being the *facilitator* supporting the breakdown of the strategy into department targets, and finally the so called *angel* placed in each department constantly reminding about the sustainability targets. There is an opportunity here for education providers to create and shape the content for these programs as the roles are undefined.

There is also a need to build a more general understanding and competence in life cycle thinking and its implications for all levels in companies. The education needs to be customised and adapted to the need of different functions and industry sectors. There is also a general need to raise the awareness of the life cycle perspective in society at large, so there should be mandatory life cycle sections in all educations.

In particular, those who are contributing to regulations, directives, standards and legislations need a broad understanding of the life cycle perspective, the methods used, impact of limitations and so forth. This is important as they are expected to constructively collaborate with different interest organisations and yet by setting hard legal targets challenge and drive development.

Finally, expectations were expressed that academia, being neutral and a hub for development and knowledge building, should continue to drive the development of technology, methods and skills.

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8. Appendices

Appendix 1: Interview questions

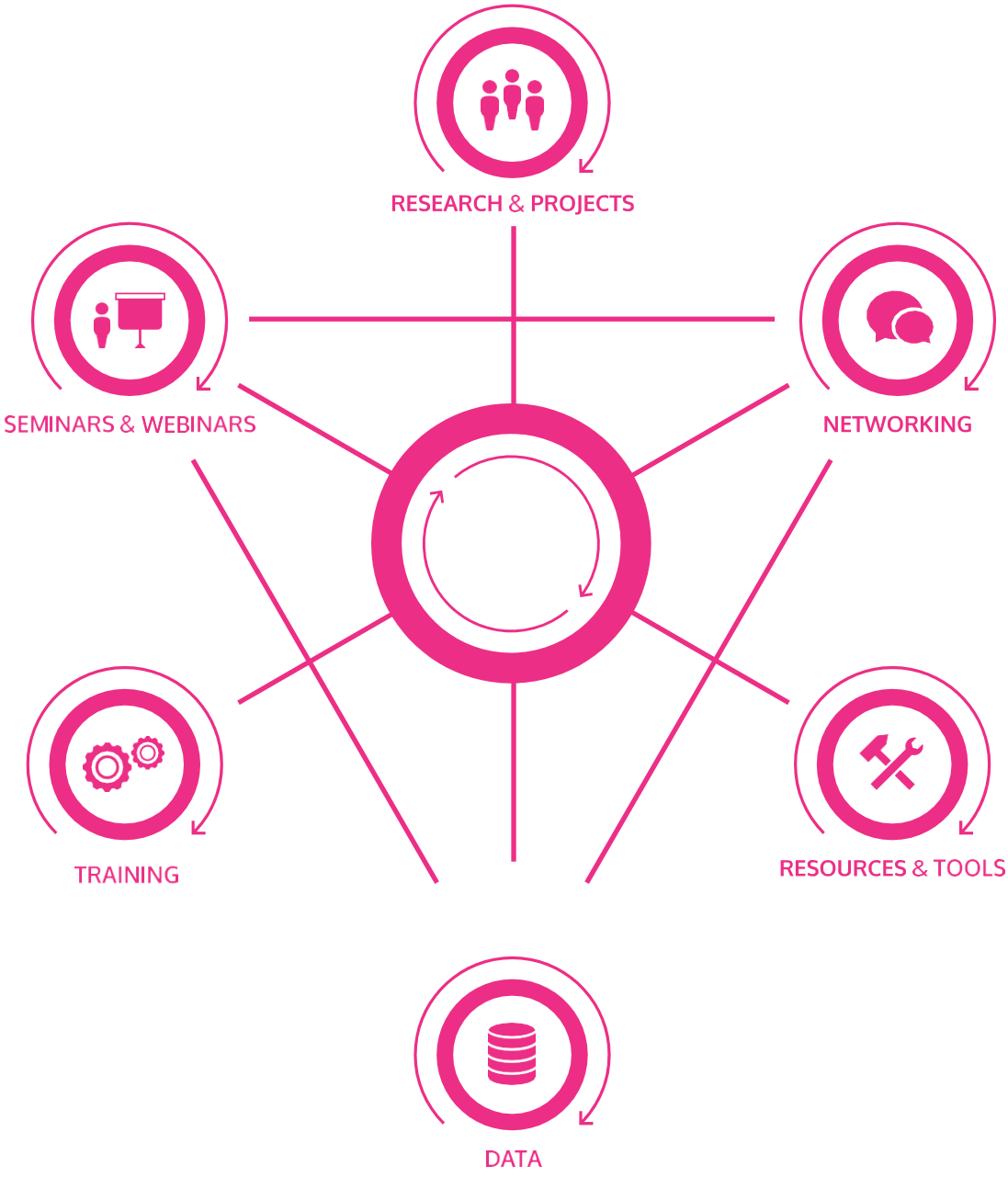
- What does life cycle perspective implicate in your organisation?
- What are the challenges with life cycle perspectives in you organisation?
- Do you apply life cycle perspective in your work? Does it help you?
- Where/How do you apply life cycle perspectives in your organisation?
- Do you see other aspects/functions than the previous mentioned where a life cycle perspective would make a difference? (Finance, Procurement, etc.)
- Do you perform life cycle analyses? Do you have internal competence or not?
- Which 4-5 environmental impact factors are the most important for your organisation?
- Does your organisation have a strategic target to become climate neutral?
- What actions do you take to fulfil the strategic target becoming climate neutral?
- What are the major challenges?
- Do you regard life cycle perspective as a tool to become climate neutral or circular? How?
- How do you work with scope 1,2 and 3?
- Which competence is required to work with the different scopes?
- Competences required internally or externally at suppliers or customers?
- Competences needed within authorities, academia or other expert functions?

Appendix 2: Survey questions

- Which are the main driving forces for your organisation to work with life cycle perspective?
- How does a life cycle perspective contribute to your organisation?
- Which functions in your organisation applies a life cycle perspective today? (Research, development, procurement, marketing, finance, etc.)
- Do you foresee that it would be of value if there were more functions in the organisation that applied life cycle perspective in their work? Describe which functions that could be.
- Do you foresee the need of new roles in your organisation to realise more aspects of life cycle perspective?
- What would be required to engage more in using life cycle perspective in your organisation?
- Which future challenges to you think that a life cycle perspective can help you overcome?
- Which competences within life cycle perspective do you foresee will be required to respond to future challenges? (Authorities, industry, academia, society, etc.)
- Do you see the need for a closer collaboration between your organisation and other players on the market to respond to future challenges? Please, describe who these players could be.

Appendix 3: Questions for the group discussion

- Which of the competences mentioned do you see as key for success?
- Do you see other competences of importance where life cycle perspectives makes a difference in an organisation?
- Do you see other competences needed to support transition into a sustainable future?
- What roles/responsibilities does academia, companies and authorities have when it comes to developing a life cycle perspective?



SWEDISH LIFE CYCLE CENTER

Chalmers University of Technology
SE – 412 96 Göteborg
Vera Sandbergs Allé 8
+46 (0)31-772 56 40
lifecyclecenter@chalmers.se
www.lifecyclecenter.se