Professional development in Global Value Chains and Life Cycle Assessment

A case study at an Argentinian institute

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EXAMENSARBETE INOM TEKNIK OCH LÄRANDE PÅ PROGRAMMET CIVILINGENJÖR OCH LÄRARE

Titel på svenska: Kompetensutveckling i Globala Värdekedjor och Livscykelanalys: En fallstudie på ett argentinsktt institut.

Titel på engelska: Professional development in Global Value Chains and Life Cycle Assessment: A case study at an Argentinian institute.

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Abstract

This master thesis seeks to investigate how an Argentinean institute support its members to learn Global Value Chains and Life Cycle Assessment. Two important methodologies that can be used as a basis to form sustainable strategies based on analyses of products or services. A Global Value Chains and Life Cycle Assessment course is held to the institute’s members who wishes to learn them. This case study has analysed the course design, the outcome and the institute’s organizational structure for professional development based on a 15-factor framework and relevant learning theories. Course evaluations, data analysis, group interviews and questionnaires were the research methods used to gather data for this case study. The thesis reveals that several important factors for professional development that facilitate the learning of GVC and LCA can be found at the institute. But, the current course design and the institute’s restriction of access to data prevents good learning outcomes for the course participants. Several suggestions regarding the course design and organisational structure were presented, based on the findings of this study.

Keywords: Life Cycle Assessment, Global Value Chains, Professional Development
Resumen

Esta tesis de maestría busca investigar cómo un instituto argentino apoya a sus miembros para aprender las Cadenas Globales de Valor (CGV) y la Análisis del Ciclo de Vida (ACV). Dos metodologías importantes que pueden usarse como base para formar estrategias sostenibles basadas en análisis de productos o servicios. Se realiza un curso de CGV y ACV a los miembros del instituto que deseen aprenderlos. Este estudio de caso ha analizado el diseño del curso, el resultado y la estructura organizacional del instituto para el desarrollo profesional basado en un marco de 15 factores y teorías de aprendizaje relevantes. Las evaluaciones de los cursos, el análisis de datos, las entrevistas grupales y los cuestionarios fueron los métodos de investigación utilizados para recopilar datos para este estudio de caso. La tesis revela que en el instituto se pueden encontrar varios factores importantes para el desarrollo profesional que facilitan el aprendizaje de CGV y ACV. Sin embargo, el diseño actual del curso y la restricción de acceso del instituto a los datos impiden buenos resultados de aprendizaje para los participantes del curso. Se presentaron varias sugerencias sobre el diseño del curso y la estructura organizacional, basadas en los hallazgos de este estudio.

**Palabras clave:** Análisis del Ciclo de Vida, Cadenas Globales de Valor, Desarrollo profesional
Sammanfattning

Detta examensarbete syftar till att undersöka hur ett argentinskt insti-
tut stöder sina medlemmar att lära sig om globala värdekedjor (GVC) och livscykelanalys (LCA). Två viktiga metoder som kan användas som utgångspunkt för att bilda hållbara strategier baserade på analyser av produkter eller tjänster. En GVC och LCA kurs hålls för institutets medlemmar som vill lära sig metoderna. Denna fallstudie har analyserat kursdesignen, utfallet och institutets organisationsstruktur för kompetensutveckling baserad på en 15-faktors ramverk och relevanta lärteorier. Kursutvärderingar, dataanalyser, grup’intervjuer och frågeformulär var de undersökningsmetoder som användes för att sam-
la data för denna fallstudie. Studien visar att flera viktiga faktorer för kompetensutveckling underlättar lärandet av GVC och LCA på institutet. Det framgår däremot att den nuvarande kursdesignen och institutetss begränsning av tillgång till data förhindrar goda läranderesul-
tat för kursdeltagarna. Flera förslag om kursdesign och organisations-
struktur presenteras, baserat på resultaten från denna studie.

Nyckelord: Globala värdekedjor, Livscykelanalys, Kompetensut-
veckling
Preface

I would like to thank my girlfriend, family, friends, supervisors at KTH and supervisors at INTI for supporting me through the writing of this master thesis. Your guidance, help and support helped me continue on when it was tough. I have learned a lot from this large project, writing it individually at a Spanish speaking institute was both demanding and exceptionally rewarding. Hope you will enjoy reading this thesis!
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## Abbreviations

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<td>GVC</td>
<td>Global Value Chain</td>
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<td>INTI</td>
<td>Instituto Nacional de Tecnología Industrial</td>
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<td>LCA</td>
<td>Life Cycle Assessment</td>
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<td>SME</td>
<td>Small and Medium-sized Enterprise</td>
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Chapter 1

Introduction

The demand for sustainable thinking at companies, organizations and universities is greater than ever before (Hesselbarth and Schaltegger, 2014; UNESCO, 2014; Field et al., 2014). While larger companies are making the investments for sustainable changes, a vast amount of small and medium enterprises (SME) are not embracing economical, environmental and social sustainability as a part of their business operations. SMEs accounts for 51% of the total employment and 44% of the gross domestic product (GDP) in Argentina (CNV, 2015). In order to make SMEs embrace a sustainable thinking to address their impact on the economy, society and environment; ACCA (2012) proposes that the SMEs should build partnerships, gain experience about their own sustainable impacts and seek information to formalize commitments. In Argentina, all SMEs have the possibility to collaborate with Instituto Nacional de Tecnología Industrial (INTI) that among other offers services for the enterprises to gain this necessary knowledge and support to make sustainable commitments. Since INTI have offices and services all over Argentina, it is important that these offices can offer sustainable services for the SMEs. This study seeks to analyse an internal course that is given towards employees at INTI who wishes to learn how to use Life Cycle Assessment (LCA) and Global Value Chains (GVC) methodologies to both improve products/services sustainability and using them to support SMEs making sustainable commitments. The course is designed as two days of classroom training and two months of distance based projects. Can the participants learn the methodologies and integrate them into their area of work? How is the learning design perceived by the participants?
1.1 Argentina

This section will briefly describe the economic, environmental, and social situation in Argentina. Also, it explains the background of why it is important for INTI to work with GVC and LCA.

Argentina is the eighth largest country in the world and Latin America’s second largest country, located in the southern part of the continent. Its geography makes for diverse climate zones with subpolar in the far south, temperate in the Pampas area, subtropical in the northeast and tropical in the northeast. The climate and massive land area of 2.8 million square kilometres are favourable for agriculture, several natural resources and renewable energy. Argentina is currently one of the largest economies in Latin America with a Gross Domestic Product (GDP) of 550 billion USD. Except from being a leading food producer in livestock and agriculture industries, Argentina is looking to develop its manufacturing subsectors and high-tech industries (The World Bank, 2017). The population of almost 44 million is well educated, which can facilitate this development. The education is obligatory until 17 years of age and offers public universities that are free of cost, almost 6% of the country’s GDP is spent on education (Estado Argentino, 2017; The World Bank, 2017).

Why GVC is important for Argentina

The sitting president Mauricio Macri faces economic challenges to reduce both the inflation of 21.6% (over 40% year 2016) and the poverty rate of 30.3% (Reuters, 2017; INDEC, 2016). Ever since the 2015 general election in which Mauricio Macri’s right-wing party gained power, the country is undergoing several transformations to open their economy to the outside world to tackle the problems (Retamozo and Schuttenberg, 2016). Mauricio Macri said that “the global value chains play an increasingly important role and offer great opportunities for the internationalization of SMEs, which are the backbone of our economies” (Casa Rosada, 2016). Up to 70% of all formal work in Argentina is generated by SMEs and it is the Ministry of Production that supports them to compete in a shared Argentine market with global stakeholders (Ministerio de

\[1\]

\[\text{[Original text:]} \text{las cadenas globales de valor juegan un papel cada vez más importante y ofrecen grandes oportunidades para la internacionalización de las pymes, que son la columna vertebral de nuestras economías}\]
Producción, 2017c). More explicitly, "the Ministry of Production of the Nation has as its mission to create more and better jobs, promote an intelligent international insertion of the Argentine economy, defend competition and institutional quality, and federalize production" (Ministerio de Producción, 2017a). Among other things, the Ministry helps Argentinean SMEs to export internationally by offering permits, reducing customs taxes, certifying products and offering workshops in several areas (Ministerio de Producción, 2017b). INTI who directly reports to the Ministry of Production, is responsible to carry out several of these actions (see section 1.2). Due to the political interest of opening up Argentina to a global market, several Argentinean stakeholders are showing an interest of GVC. Therefore, INTI seeks to increase the competence of its members in the GVC area.

Why LCA is important for Argentina

The increased environmental debate in Argentina and the country’s adoption of the United Nation’s sustainable development goals puts pressure on making the current national production sustainable (UN, 2017). Also, the environmental debate has in several countries created demands for importing environmental friendly products and services. Therefore, Argentina needs to offer products and services that fulfil both the national and international current and future environmental requirements. This is even more relevant because of the country’s current politics to open the economy for an increased global trade. For the Argentinean government and the SMEs of the country to make these changes, several methodologies are considered. LCA is one of them, that can help analyse the existing products or services to measure its environmental impacts.

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2[Original text:] El Ministerio de Producción de la Nación tiene como misión crear más y mejores empleos, promover una inserción internacional inteligente de la economía argentina, defender la competencia y la calidad institucional, y federalizar la producción.
1.2 Instituto Nacional de Tecnología Industrial

INTI (2017b) is working to develop technology and knowledge in the industrial sector in Argentina. It is a self-governing institute that directly reports to the Argentine Ministry of Production. There are 51 centres located throughout Argentina that works with research and development (R&D), each centre has its own specializations depending on the demand and prerequisites in the provinces (see Figure 1). Each centre often involve several research areas, and each research area is often found at several centres. The R&D activities are developed side-by-side with the local industries to ensure its effectiveness. INTI works in conjunction with business chambers, industrial specialists, public companies, state laboratories and universities, both national and international, to cover all industry areas in Argentina. The centres of INTI has the role of boosting the industrial growth in the provinces by offering the latest R&D for the industry. Besides working with R&D in the industrial sector, INTI also acts as a national reference of measurement since its constituted as the National Institute of Metrology. It means INTI has the role as a certifier of standards and technical specification in both regulated and voluntary areas of products, processes and employee competencies. This includes activities such as setting new measurements, maintain and ensure that its qualities are related to the environment, safety, health, food, fairness in both trade and quality of industrial production.

Almost 80% of all the services that INTI has to offer, developed by the 51 regional and multipurpose centres in Argentina, are aimed towards small and medium sized enterprises (SME). The aim is that the enterprise’s local and international competitiveness is enhanced to create more jobs and develop new markets by incorporating the innovation, design and technology offered by INTI (INTI, 2017b; Rosso and Wittner, 2017).

Within the specific research and development centre for environmental issues at the organization, their mission is to "Incorporate into the Argentine productive system an environmental management that promotes sustainable development" (Rosso, 2016, p. 4). The centre
can invite local professors from universities to hold courses to educate companies, members of the organization and other stakeholders with the aim to increase knowledge in the field of environment and sustainable development (Rosso, 2016). In this case the Industrial Design centre requested a course in the GVC and LCA methodologies, whereby the Environment centre together with the Personal Development centre at INTI invited professors from an Argentine university to hold it (Wittner, 2017). The professors from the university reconstructed an existing GVC and LCA course to fit with INTI’s conditions and requirements.
1.3 The course: Management of economic, social and environmental sustainability

The expected learning outcomes from the course are:

- Carry out a chain map for a simple product or service, and describe the major problems and potential improvements.

- Carry out a simplified LCA for a simple product or service, and describe the major problems and potential improvements.

- Integrate the three pillars of sustainable development into a product’s or service’s innovation, design, and production phases with the help of LCA and GVC.

- Make decisions based on the results from GVC and LCA tools to minimize environmental footprints, reduce energy and resources, improve economic performance, and identify design interventions in production stages, supply chains and local impacts.

The course is divided into two modules to deepen the understanding of the content (see Table I). Module 1 introduces the GVC and LCA methodology, together with some practical exercises. All participants attend a two days long classroom workshop with theoretical classes in the mornings and practical activities in the afternoons. The first day is dedicated to introducing the GVC methodology, which is to understand what is a chain map and what global value chains are and the relationships between the chains and discover potential developments. The second day introduces the LCA methodology and theoretically how the LCA tool D4S (literature and excel worksheets) works. During module 1, the participants do not learn how to use the GVC and LCA tools, they are only briefly explained with only some hands-on experience. Module 2 consists of two group projects carried out at the participants own offices during two months with frequent virtual feedback (mainly e-mail) from the course professors. The first project is to analyse the impact of a simple product or service using the GVC and LCA methodologies. This includes designing a chain map (GVC methodology) and using it to understand where in the process to apply the D4S excel-based tool (LCA methodology) to evaluate the product’s or service’s environmental impact. The second project is
to make a proposal for improvement of the product or service based on the conclusions from the first project.

Table 1: Description of the course modules

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<tr>
<th>Module</th>
<th>Location</th>
<th>Duration</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Buenos Aires</td>
<td>2 days</td>
<td>Introduction to GVC and LCA</td>
</tr>
<tr>
<td>2</td>
<td>Distance</td>
<td>2 months</td>
<td>Two group projects</td>
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The teachers are professors from an Argentinean university who uses material from a similar course held at the university. The main difference is that module 1 lasts for five days instead of the course at INTI who only lasts for two. At the original course at the university, the participants get to learn how to apply the GVC and LCA tools during module 1, while at the INTI course they are not.

This course will be given to internal INTI employees that have contact with subjects of design, environment, production and territorial sustainability. Also, INTI members who work with projects associated with product value chains can take part of this course. There are no academic qualifications required to attend the course, although most of the qualified participants working at INTI are engineers or licentiates (Wittner, 2017).

1.3.1 Participants

The 27 participants that took the course at the event of the case study are employees working at INTI in the industrial design area. The 27 participants were grouped into five different groups, all the group’s participants worked at different INTI industrial design centres in Argentina. According to INTI (2017a) this centre works with six main activities:

- Technical assistance. Generate capacities in the targeted audiences, develop the local capacities to fit the innovation challenges and technically assist productive sectors in the country

- Designer base. Offers a professional network where INTI has the function of a communicator between the supply and demand of industrial designers in Argentina.
• *Job search.* Publishes labour offerings from companies that are communicated towards industrial designers all over Argentina.

• *Design certification.* Offering guidance for companies to improve their product design and development processes according to best known practices to achieve their certifications.

• *Design diagnostics.* Offering companies to have their products analysed to receive proposed actions for design improvements, these improvements include increased quality, innovation, sustainability etc.

• *Materialization laboratory.* Promotes good design practices by advising companies on the benefits of implementing verification and testing instances by advocating the use of models and prototypes in the product development stages.

Note: The course participants are to be interpreted as the INTI employees, not SME employees.

### 1.4 Aim

The aim of this study is to investigate how an organisation is supporting its employees of the industrial design area to use GVC and LCA methodologies as an approach to assess SMEs.

The research questions are:

• *How do the organisation support the participants to learn the GVC and LCA methodologies? What obstacles and opportunities are there for understanding and reasoning about the GVC and LCA methodologies?*

• *How does the participants choose to integrate the GVC and LCA methodologies into their work and what are the challenges when doing so?*

### 1.4.1 Delimitation

Concerning the size of the field study, only one event could be included in this thesis. The observed course was held for the first time and the upcoming scheduled events were not being held within the time limit of the thesis. Due to these restrictions, the study was limited
to qualitative methodology. The collected data from the participants was limited to the course evaluation, inquiry by mail and interviews, these were conducted 3 weeks after the course had been finished. The interviews of the participants were limited to the participants living in Buenos Aires.

1.5 Structure of the report

In the Introduction chapter, the reader will get an understanding of the study’s aim as well as the analysed course and the organization. The chapter Theoretical background includes all the necessary theory and literature regarding sustainability science and pedagogic frameworks needed to analyse the gathered information from the field studies. Method seeks to explain how this study was carried out in such a way so the reader could recreate it and still would gain the same results. The chapter Results presents the outcomes from the study, both from the literature and field studies are included. Analysis of results use the theoretical frameworks to analyse the gathered data to find results related to the research questions. Discussion puts the results in a perspective by critically analyse its validity and limitation.
Chapter 2

Theoretical background

This chapter first presents a more technical framework, it defines sustainable development (see subsection 2.1) and two system analysis methods that are part of the course content (see subsection 2.2). Secondly it describes a pedagogic framework for professional development (see 2.3). This is the framework that will be applied and tested for this study.

2.1 Sustainable development

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 41).

Whilst there is not one but several definitions of sustainable development, this report will be using the holistic definition mentioned above, otherwise called as the "Brundtland definition".

Environmental sustainability regards the ecological environment, in which way it endures and persist being diverse and productive. The economical sustainability is defined as optimally using existing resources for a long-term responsible economical balance. Yiftachel and Hedgcock (1993, p. 140) defines social sustainability as “the continuing ability of a city to function as a long-term, viable setting for human interaction, communication and cultural development”. To achieve a sustainable development, economic, environmental, and social policies can no longer be separate but instead needs to be integrated with each other (Sustainable Development, 2007; Summit, 2002; UN General As-
2.2 System Analysis methodologies

To analyze a system, a system boundary and all its parts needs to be identified and included. Instead of only looking at separate parts, the system can be analyzed through a holistic point of view where all activities to create a product or service is included. The goal of such methodology is to avoid sub-optimization and undesired effects by creating awareness of the complex connections between the separate parts in a system (IIASA, 2015). Systems analysis is a multidisciplinary research field that study the interaction between systems and the economical, environment or social dimensions. The analysis methodologies have the objectives to contribute a basis for sustainable decision making for a behavioural change at an individual, organizational, and societal level (Moberg, 2006). A system analysis methodology that measures environmental impacts is Life Cycle Analysis. Global Value Chain analyze instead economical and social relations and impacts within a system. Together these two system analysis tools considers the three dimensions of sustainable development, and will be explained further.

2.2.1 Global Value Chains

“The different processes in different parts of the world that each add value to the goods or services being produced” (Cambridge Dictionary, n.d.).

A value chain describes all the activities made to bring forth a product or service from its conception, production stages, assembly, product services to its end use. When these activities take place between several geographical locations and firms, the value chain can be considered a Global Value Chain (GVC). With today’s global cooperation, one company may extract a product’s raw material, processed by another one in another country, and supervised by a third-party organisation. To better understand the connections of all stakeholders, a Chain Map can be designed (see Figure 2). By mapping out all the activities, it can be easier for multi-national companies to restructure their operations to optimize their operations.
Global Value Chains for SMEs

Due to the international competitiveness and the rise of large multinational producers, retailers, and marketers; the global value chains are changing to be more consolidated around the major consumer markets in North America, East Asia and Europe. Other regions can be affected from this, that creates an opportunity for SMEs to establish themselves on the market. It is important to understand the activities in a GVC and where it is beneficial for a SME to enter, i.e. which activity in the GVC displayed in Figure 2 that the SME can be a part of. Gereffi and Fernandez-Stark (2016) proposes a four pillars model that governments and organisations should follow to facilitate for SMEs to participate in GVCs,

Access to market. Establish a link between the producers and buyers by easing the interactions until the producers independently can manage it. It is also advised to educate the buyers concerning the potential business of using small enterprises.

Access to training. Specialized training that emphases on improved quality, usage of new technology and productivity can make the enterprise available for complying with standards and receive certifications needed to enter the GVC.
Coordination and collaboration building. Both vertical and horizontal coordination’s are recommended. Vertical coordination’s between actors can establish important linkages for improvement of the whole chain. Horizontal coordination focuses on collective action to increase their scale thus enhancing their competitiveness in the market. To successfully coordinate between the actors, both vertically as horizontally, the SMEs needs to establish themselves through a formal organization.

Access to finance. To enter certain value chains, it is sometimes required to invest in certain technologies or methods to obtain needed certifications. For a single enterprise, these investments can be difficult to make due to economic constrains (lack of guarantees, high risk etc.). If the SMEs instead can organize themselves, the risks can be reduced thus opening a way for these necessary investments to enter the desired value chains.

Using Global Value Chains for sustainable development

After a value chain has been designed with all involved activities, it can be used to analyse how economic, environmental, and social values are created from every activity in the chain (Frederick, 2016; Cattaneo et al., 2010). It can also be used to understand where possible improvement of the value chain’s activities can be made (Caracciolo, 2013).

Regarding the social sustainability, a value chain can be analysed to promote social inclusion by looking at the relation between jobs and skills. If there are few job opportunities in the value chain, job creation is desired. Instead if there are low levels of skills, capacity building is desired. These two strategies can be used to understand how vulnerable groups can be integrated that do not have favourable capabilities nor competitive benefits (UNIDO, 2015).

Concerning the economical sustainability, analysing a value chain can be used to promote economic integration. Organizations in developing countries can analyse a global value chain to understand how foreign intermediate products can be imported and continue the production process in the country. A local company in the developing country can be responsible for this continued production process and is now integrated in an international production network without having to construct larger production factories. This can reduce the overall
imports to the country while creating several job opportunities (Berger et al., 2017).

Analysing a product’s or service’s value chain can give insight about the processing, resource use, recycling, and waste management. This information can be used to understand how a product can reduce its environmental impact by changing material or processes. Analysing a product’s GVC as a methodology to meet requirements of environmental standards and policies are common (OECD, 2015; Berger et al., 2017; UNIDO, 2015).

### 2.2.2 Life Cycle Assessment

“LCA addresses the environmental aspects and potential environmental impacts (e.g. use of resources and the environmental consequences of releases) throughout a product’s life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave).” (ISO, 2006, p. v)

LCA is a methodology that has been developed since the 1960s with new modelling approaches and an increasing interest in the last years. Larger companies and organizations have addressed the need to measure environmental impacts to work towards sustainability. This has raised the popularity of the methodology, several studies have been positive towards its way to provide quantitative information about the environmental impact of a product or service (Guinee et al., 2010; Hauschild et al., 2005). However, the verification difficulties of the quantitative results have been discussed due to lack of data, proper methodology knowledge and verification of existing data (Seidel et al., 2009; Thomas and Jan, 2007; Gaines and Stodolsky, 1997).

To identify a product’s or service’s environmental impact, all inputs and outputs need to be accounted for during its life cycle. There are several ways to define within which boundaries that the impact can be accounted for, it is called defining the goal and scope which in practice can be described as defining the system boundaries (see Figure 3). The next step is to do an inventory analysis, the goal is to identify and quantify all inputs and outputs of both material and energy that passes through the system boundaries. An impact analysis is conducted after the inventory analysis, it enumerates the environmental impacts from both the energy and material inputs and outputs.
The user will receive values from the impact analysis that accounts for the product’s or service’s environmental impacts, divided into several categories such as ecotoxicity, land use and global warming. The next step in the LCA is to do an interpretation of the results, to find out which activities and parts that accounts for most of the impact. The interpretation will usually work as a base for future improvements when choosing energy, material, geographical locations etc. for the analysed product or service (ISO, 2006). An improvement analysis based on the impact measurement may be the next LCA step, one or several of the inputs and outputs can be changed to reduce the environmental impact during the product’s or service’s life cycle (Moberg, 2006).

Figure 3: The four phases of a LCA (source: Adapted from ISO, 2006)

The LCA tool is increasing in popularity, with the ongoing discussions about sustainable changes SMEs are also considering LCA as a possible option to overview their activities. Due to the complexity of the tool and the limited resources that SMEs have, a complete cradle-to-grave LCA is not fitting. Instead Life Cycle Thinking (or simplified LCA) can be a more fitting assessment, it is function oriented that relates the supply of products to the proposed sustainable developments instead of quantifying the impacts (Bidstrup, 2015; Martin, 2016). Promoting simplified LCA for SMEs can be realized with three general methods:

- Provide simplified tools that focuses on more general quantita-
tive data when designing a LCA. (ISO, 2006; Martin, 2016; Naldesi et al., 2004; Sherry et al., 2012).

- Create guidelines and strategies for SMEs to adopt simplified LCA (Naldesi et al., 2004; Zackrisson et al., 2008; Le Pochat et al., 2007).
- Convince the SMEs to embrace simplified LCA (Daddi et al., 2015).

2.3 Professional development

This chapter will describe the pedagogical framework used to analyse the result from this study. Professional development itself is defined as "the development of competence or expertise in one’s profession; the process of acquiring the skills needed to improve performance in a job" (Oxford Dictionaries, 2017). The competence consists of several factors such as education, experiences, personal characteristics etc. To understand professional development, perspectives on learning will be explained which are relevant theories on learning. There is not a single "best" approach, learning is complex and the different perspectives will all be important since their importance depends on the situation (Ertmer and Newby, 1993). Also factors for professional development will be explained to understand theories of good practices to enhance the professional development at a workplace.

2.3.1 Perspectives on learning

There is not a single definition of learning, several ways of describing it exists and are still being developed. But as Ertmer and Newby (1993) describes, it is not the definition itself that separate the theories but the interpretation of them. This chapter that is describing perspectives on learning will therefore explain both their definitions and interpretation to understand them well.

Pragmatism

Pragmatism is based on learning takes place through inquiry. It is possible for a statement to become knowledge for a person only by engaging in a problem. This is what Dewey (1997) refers to as "learning by
there needs to be a continuity between a person’s own experiences and the learning content. Because of the pragmatist view that the reality is constantly changing, the learners need to adapt to this changing environment and its members. For this reason, the learning activities should focus on the social interplay between persons and on hands-on problems that are related to the reality of that learner. The learning outcome through a pragmatic point of view is when the knowledge is useful for the learner (Säljö, 2015). Teachers should have an objective of teaching content that in some way present “cash value” (James, 1907, p. 200), or utility for the learner.

Cognitivism

Piaget (2008) was a pedagogue and cognitive development psychologist in the theory of learning called constructivism. The theory explains that the human construct its own mental framework of the outside world as she actively interacts with it. The human’s mental framework, also called schema, works as behavioural instructions of a person. These schemata can be changed, coordinated, and expanded through accommodation and assimilation processes. Assimilation of a situation occur when the existing schemata are sufficient to respond to it. Accommodation is when existing schemata are not sufficient to handle a situation, instead they are restructured so the situation can be assimilated. Learning is not only a transfer of information from the teacher to the student (assimilation), but requires that the student actively analyses the information and restructure schemata to understand it (accommodation). Together these processes creates a cognitive state of equilibrium (Illeris, 2007). Accommodating new information that requires the person to reflect upon its own knowledge and learning demands that the person has confidence, critical thinking and time (Ellström, 1996; Ellström, 2006; Høyrup and Elkjær, 2006). The cognitive perspective on learning view the learning and change as an internal process. The changes take place as an accommodation process of the person’s mental schemata to understand the concept (Piaget, 2008).

Socio-cultural learning

The socio-cultural perspective on learning was created by Vygotskij (2001) who used a Darwinist approach, instead of Piaget’s biological point-of-view. The theory is based on the social contributions impor-
tance for the development of understanding rather than Piaget’s self-motivation. It explains that, how much a student can learn is affected by the environment. By receiving guidance from a more knowledgeable person (i.e. someone who has a better understanding of the concept), everyone can go beyond their own potential conceptual world of understanding and enter the Zone of Proximal Development (ZPD). Based on the theory of ZPD, it is therefore recommended to design learning activities where students receive encouragement and guidance from more knowledgeable students, teachers, or electronic tutors. The perspective on learning as a social construction reject the view that learning is only an internal process. A person is instead a part of a larger social context where both internal and external processes needs to be considered. The learning outcomes and changes depends how the knowledge is observed. The socio-cultural perspective looks at the learning outcome as how a person may appropriate knowledge from the use of cultural and social artefacts (Vygotskij, 2001). This appropriation is integrated into the prior cognitive schemata (Billett, 1998). Thus, each person construct their own recognition of knowledge that is important and useful from the original content.

**Situated learning**

Based on the theory of situated learning, learning is a social process where the learners acquire knowledge by participating in sociocultural practices. It criticizes the theory of cognitivism that knowledge is an abstract representation of information, instead it is a personal representation. Learning is not a transfer of an abstract understanding but instead a social construction between persons. The process of learning involves the learner to become more involved in the community of practice in which both beliefs and behaviours can be acquired (Lave and Wenger, 1991). This is what he recalls as a legitimate peripheral participation where the learner begins by learning simple tasks and continuously learn more difficult tasks.

According to the perspective of situated learning, changes, and learning outcomes should be recognized as the development of a person’s identity and its behaviour in the community of practise. Both the student and the teacher are a part of this community that is built upon an area of knowledge. Evaluating the learning outcomes and changes should take this relation in consideration, therefore the processes are
of more interest rather than the final product. Säljö (2015) explains that both the situated and socio-cultural perspectives share the view that knowledge is not about reproducing something known but instead apply the knowledge in other cases. Concretize the abstract is an important part of the learning process.

Discussion about the perspectives on learning

While the mentioned perspectives share similarities and differences, the discussion is not about which theory that is "best". Instead Ertmer and Newby (1993, p. 61) propose that teachers should ask themselves "which theory is the most effective in fostering mastery of specific tasks by specific learners?". Their utility depends on the situation itself. When planning a learning activity, it is important to understand both the level of the learners and the complexity of the area which is to be educated, to effectively teach the participants.

While a specific behaviour can be desired, Säljö (2015) explains that the behaviourism fails to explain how a learning activity can be designed to teach more abstract content. Ertmer and Newby (1993) instead recommends the learning activities to be designed based on the cognitive or constructivist perspectives on learning. The cognitive and pragmatic perspective both shares the view that the learning activities should be designed to be centred around the learner. The abstract content needs to be meaningful to the learner by designing learning activities that engages them (Ertmer and Newby, 1993). This view of knowledge is shared by the socio-cultural and situated perspectives (Säljö, 2015). But understanding how the knowledge is applicable to the environment is its own type of knowledge. It’s a dualist view that learning is both an internal and external process. The learning activities according to the socio-cultural and situated learning should be focused on understanding both when the content is useful and how to use it (Nelson, 1996).

2.3.2 Factors for professional development

Promoting professional development in public sectors is of interest for the organizations to adapt to the changing society and technology while strengthening its productivity (Wodecka-Hyjek, 2014). How to promote it efficiently have been discussed frequently. Chiva et al.
Chiva-Gómez (2004) have distinguished two approaches on organizational learning based on existing literature studies. The first approach is based upon the socio-cultural perspective by asking, how can the social environment be designed to enhance the learning? The other approach is based on the cognitive perspective by trying to understand how cognitive processes lead to professional development. Promoting professional development at an organization can be made from one or both approaches. Chiva-Gómez (2004) have proposed a model that he refers to as “the factors that facilitate organizational learning”. It includes theories from eight different studies and are summarized as 15 important factors to enhance the learning experiences at an organization. Chiva applied this model to understand the professional development at four Spanish ceramic companies. He identified the factors in each of the four companies and discussed if the factors that were lacking were important for improving the professional development. Now this model will be used in this study to understand the professional development at INTI. The factors will be described below:

1. **Experimentation, new ideas, continuous improvement, rewards, openness to change.** Describes if an organization has the eagerness and capacity to welcome changes. This is possible if both the members and the organization can suggest ideas and being open to follow them up. Proposed ideas should not only be accepted but encouraged. Continuous improvement is explained as if the changes take place proactively.

2. **Observation, openness and interaction with the (uncertain) environment.** The organization should have a constant awareness and observation of the activities from other institutes, companies, universities, consumers and political decisions. This awareness should result in adjustments such as projects or investments from the organization to meet changes that can affect its stakeholders. Does
the organization examine the environment? Are there any co-
operations with companies, other institutions, or universities?

3. *Mistake and risk acceptance.* It is described as an organization that
can make risky investments or introducing projects in new mar-
kets or area while still accepting negative outcomes. Cost of fail-
ure should be an investment and experimentation. Personal se-
curity should be prioritized if mistakes and failures occur.

4. *Heterogeneity, diversity.* The organization should involve differ-
ent departments and personnel in the decision making to receive
heterogeneous viewpoints. It refers to the culture itself and how
it is displayed in the areas. Is a diverse working staff favoured in
the organization?

5. *Dialogue, communication, and social construction.* A dialogue be-
tween its members is needed to establish an accepted under-
standing by enlighten the misunderstanding of concepts and pro-
cesses (Chiva et al., 2007). How is the communication within the
organization and between the departments? Are the communi-
cation alternatives good?

6. *Continuous training.* The organization should continuously re-
view the performance of the current objectives and develop the
training based on it. The members should be able to learn con-
tinuously through receiving support of ideas and taking courses.

7. *Delegation and participation (empowerment).* It refers to how ideas
and processes are delegated to members at all levels of the orga-
nization. Empowerment comes from the managers that delegate
ideas and methods among members at all levels within the or-
ganization. The objectives for a new ideas or process can be de-
termined by both managers and the subordinates instead of only
being decided by the managers.

8. *Teamwork, importance of the group, collective spirit, collaboration.* An
organization should have a working climate where the people
are encouraged to work in groups and where other members are
co-workers and not opponents. This is also important between
different departments, the members from different departments
respect each other as co-workers. Collaboration comes from ex-
changing ideas and knowledge together.
9. **Workers who want to learn and improve.** For a successful professional development at an organization, the members should feel motivated to complete the learning activities. The organization should design the activities to encourage the members to take part of the courses and its accompanying exercises.

10. **Leadership committed to learning.** The managers should commit to the professional development activities and objectives that has been decided within the organization. The organization should encourage the managers to train others, taking risks and make changes. Committing to learning implicates that the managers should feel supported to continuously look for how the group can increase its knowledge.

11. **Learning as an essential element in the strategy (measurement).** The organization should have learning as a core strategy, allowing its members to continuously participate in courses to increase their competence. It is not only focusing on learning activities itself but the learning outcomes should be measured as a part of the strategy.

12. **Organizational and managerial structure not very hierarchical, and flexible.** Everyone should feel comfortable speaking with any manager within the organization. There should be an equality between its members and the possibility to discuss matters without a hierarchical structure that prevents this exchange. An idea from a manager should be open to criticism from subordinates.

13. **Knowledge of the organization’s objectives and strategies, ready access to information (transparency).** There should be an exchange of information between the areas and organizational levels. Everyone should understand the organization and its strategies, projects and objectives. The members should also understand how their own work constitutes to the main objectives and strategy. The information within the organization should also be transparent, secrets should not be kept but instead be knowledge that can be shared.

14. **Sense of humour.** Can humour be found within the organization and is it favoured? Having a sense of humour within the organization is as a tool to express critique towards current strategies
and procedures. It is a way to dismiss ambiguities within the organization (Weick and Westley, 1996).

15. Improvisation, creativity. There should be room for the members and in the projects to be creative and being able to improvise. The organization should not have too strict procedures and demands that counteracts possible moments to be creative. It implies that the managers should encourage its members to be creative and improvise when it comes to suggesting ideas or solutions to problems.
Chapter 3

Method

To address the aim of this study, a theoretical evaluation of the possible outcomes needed to be compared with an empiric evaluation. Only when the intended results are compared with the real results, a pedagogic activity may be assessed (Bjørndal and Nilsson, 2005). In this case, the empiric evaluation had to be designed in a way to give credibility to the result of the study due to the premise that the possible observations of this course were restricted to only one course offering with 27 participants in total. A qualitative oriented research method was therefore chosen, case study of one course at INTI. The data collection included course evaluation, questionnaires for the participants and course team as well as two group interviews with some participants.

3.1 Literature studies and selection of framework

Most of the literature studies were carried out before the field studies, thus gaining a deeper knowledge of the GVC and LCA methodologies as well as the expected results from the course itself. By understanding the criteria for the expected results of the course, only then it is possible to evaluate the results. This pursue the recommendations of Bjørndal and Nilsson (2005), to first choose a focus within the frames for the evaluation and secondly choose the criteria that will be used to carry out the evaluation.

The literature studies were carried out using the KTH Library, the
National Library of the Argentine Republic, the Congress Library of the Argentine Republic, KTH Primo, Google Scholar and course documents provided by INTI. Primary keywords used for the literature search in the internet databases were *Life Cycle Assessment Education, Global Value Chain Education, Sustainable Development Education, Professional Development, Organization learning*. For every search, the first 20 results were read to analyse its relevancy and usefulness for this study. All literature concerning the course itself was provided by INTI and the teachers; the documents, course syllabus, links to GVC and LCA programs could be found on a website provided by the teachers.

The framework was chosen because of its richness with the 15 factors and a possible complement to the described learning theories. It had already been tested for four different Spanish ceramic companies and was interesting because Argentina and Spain share to some extent a similar work culture.

### 3.2 Selection of the course

The centre for environment at INTI provides several courses, both internal and external. The chosen course for this study, *Management of economic, social, and environmental development*, was a newly developed course. The centres for environment and human resources at INTI had developed this course together with the University of La Plata who already offered a similar course for its students. The observed group was the first from INTI to take this course. Investigating how the group was going to learn to use two complex system analysis methodologies, mostly from distance based learning was appealing. The selection of the course with the specific content was also of great interest for this type of study because there were current political incitements from Macri, the sitting president, to integrate Argentinean business into the global value chains.

### 3.3 Case study

Since this thesis seeks to investigate a specific course and how the participants reflect over their own understanding and integration of the content, an instrumental cumulative case study was decided to be used according to the recommendations of Hamilton and Corbett-
Whittier (2012). Several kinds of data were used for this qualitative 
research method (Hamilton and Corbett-Whittier, 2012; Bjørndal and 
Nilsson, 2005). This study included a document analysis, course eval-
uation, group interviews and questionnaires to capture several cases 
from which it is possible to draw conclusions on specific developments 
and phenomena.

Course evaluation

The course evaluation was conducted by INTI as a part of their edu-
cational activities, the author of this study did not make it. The course 
participants were asked to fill in a course evaluation when the course 
ended. In total 23 participants out of 27 chose to respond, the re-
results can be found in Chapter 4.1. The evaluation was divided into 
several categories; general evaluation, course content, course design, 
other comments. For every category, the participants had to grade the 
quality of the course (1-5 scale) and answer a related question. Because 
of its high response rate (23 out of 27 participants), it can be used as 
an indication within the study group itself. The course evaluation was 
used to identify key problems, which helped how the questionnaire 
and group interview questions could be designed. To a certain degree, 
the evaluation was used to analyse the learning outcomes from the 
course.

Questionnaires

Two questionnaires were sent out, one to the course team (see Ap-
pendix B) and the other to the course participants (see Appendix C). 
They were used to gain a better insight of the course experiences from 
both perspectives before conducting the group interviews. The ques-
tions that were developed for the interviews were based on the three 
general recommendations that Bjørndal and Nilsson (2005, p. 100) presents.

- **Difficult words.** All words were chosen to avoid misunderstand-
ing. An INTI employee reviewed the questionnaires before they 
were sent out.

- **Receive enough information.** The questions should include the nec-
essary information to answer with the same unit without misunder-
standings. The time was explained to be stated in hours.
• Under**stand how to explain.** It should be easy to understand how to answer a specific question. All questions tried to ask for explaining text answers. However, one question regarding the course participants prior GVC and LCA knowledge was not explained enough for them to understand what was the sought way to answer.

These questionnaires were carried out by sending out a document with several questions by mail, the responses were sent back in written form. These surveys were conducted because of the different geographical locations of the course participants.

**Group interview**

The group interviews were designed to concern three general themes (professional development at INTI, course design, GVC and LCA knowledge) but with several questions within the frame for these themes. According to Bjørndal and Nilsson (2005) having few themes increases the quality of the information. De Hoyos and Barnes (2012) suggests to analyse the complementary data such as feedback, observations and reports before performing the interviews to understand which questions are of relevancy. Therefore, the group interviews were carried out after the information from the questionnaires and course information had been analysed. The interviews had a low degree of structure based on recommendations from Bjørndal and Nilsson (2005) for a group interview. An interview guide was used as a framework to keep the conversation within the chosen themes and ask further questions if needed. It can be found in Appendix D.

Two different group interviews were conducted because of the availability of the participants. Three participants were interviewed during the first interview and the other two were interviewed during the second interview.

**Selection of participants for the group interview**

To discover several different variations within the frames of this case study, Höst et al. (2006) advises that the studied persons should be as diverse as possible. From the original class of 27 participants, only five worked at the industrial design centre in Buenos Aires. All five were asked and agreed to participate in the group interviews. The course
teachers explained that only two groups out of five carried out their projects (during module 2). Both participants that could and couldn’t finish the projects (module 2) were chosen to be included in this study. The selected participants for the group interviews all worked at the head office in Buenos Aires. The participants had all been working in different groups during module 2 of the course. Also, the participants had different former experience from working with GVC and LCA as well as different positions at INTI. The background of the five chosen participants for the group interviews are described below. The result from the interviews can be found in Chapter 4.4.

- One has studied industrial design and has worked at INTI for several years. Had superficial knowledge about GVC and LCA before the course.

- One is a docent in the industrial design area and has worked at INTI for several years. Had superficial knowledge about GVC and LCA before the course.

- One is a docent in industrial design and have worked at INTI for several years. Had great understanding of LCA while no experience with GVC before the course.

- One is a docent in the industrial design area. Has been working at INTI for less than a year. Had no experience with neither GVC nor LCA before the course.

- One is a docent in industrial design, has worked several years at INTI and has a leadership role. Had superficial knowledge about GVC and LCA before the course.

### 3.4 Analysis of gathered data

The analysis was done to create theoretically meaningful categories for this study by following the recommendations of qualitative data analysis according to Byrne (2016). Both measuring the data and establish its meaning is important to create a holistic view of the data as a base.

\[\text{Note: The order of the description of the participants are randomized to protect their identities}\]
for the analysis. The analysis of the complementary data (questionnaires, course evaluation, course syllabus) were done before the group interviews. De Hoyos and Barnes (2012) recommends to do it before performing the interviews to understand the questions relevancy and what to focus on. The recorded audio from the group interviews was afterwards summarized for each category (introduction, professional development, course design, participants knowledge of GVC and LCA after the course, and conclusions).

### 3.5 Analysis of results

To understand how INTI has organised the professional development for its industrial design members, a theoretical framework with 15 factors for professional development was used. The found factors at INTI were motivated based on the collected data from the course evaluation, group interviews, questionnaires, and resources at INTI.

The analysis had a different approach to understand how the course participants learned and used the GVC and LCA methodologies based on the investigated course. The collected data could highlight several aspects in the course that turned out to influence the learning outcomes. These aspects were then analysed with the theoretical framework.

### 3.6 Limitations

Since module 1 was hold before the field studies of this thesis, an observation of the two day introduction workshop was not possible. Instead, this study took place during the module 2 when the participants were working with the projects in their groups from distance. This is an important observation that is not included in this study and that could have enriched the understanding of both the course and social exchange between the members.

### 3.7 Validity and reliability

The validity of a study’s results can depend upon the researcher’s background and objectivity. Maxwell (2013) says that the researcher
can influence the studied environment, especially during a qualitative research. The researcher should try to understand the possible influences rather than eliminating it. Since the research of this study took place in Argentina and the researcher has a Swedish background, it was important during all parts of the conducted study to review one’s prejudices that could influence the study. The researcher had experience from studying in Argentina one year and visited INTI several times during the study to get a better insight how courses at INTI were carried out.

All questionnaires and interview questions (see Appendix B, C and D) were reviewed by an Argentinean employee at INTI and supervisors from the KTH university before sent out. The results from these data collection methods were discussed with the same persons to reduce the possible prejudices that can affect the interpretation of the results. It can also reduce misinterpretations since looking at a problem through different perspectives, called triangulation, can increase the credibility of the research’s results.

The transferability of the results from this research depends on how the reader defines the generalisability based on the study’s conditions and methodology. This study was conducted at INTI that is a large governmental R&D institute in Argentina whose working conditions can show difference from other organisations or companies. During the group interviews, one participant said that “the industrial design training at INTI is way better than what the private sector is offering”. These differences have not been analysed in this study and should be considered regarding the generalisability of the results towards the private sector. Nevertheless, the results can show an indication how participants learn the GVC and LCA methodologies based on the course design and the professional development structure at INTI.

### 3.8 Ethics

This study followed the recommendations of Forskningsrådet (1996) by pursuing the four principles of ethics.

*The information requirement* explains that all concerned persons in-
cluded in the study should be informed about their role in the study, the conditions for participating and that it is voluntarily. Any time during the study, the participants could choose to withdraw their contribution. This was explained in the questionnaires and before the group interviews took place.

The consent requirement describes that the researcher should gather the consent from the concerned persons in the study. The participants in the group interview were asked if the interview could be recorded beforehand.

The confidentiality requirement asks that all information that can be tracked towards the study’s participants should be stored in a way so unauthorized persons cannot find it. All names in the study have been replaced with a letter, also the order have been randomized.

The utilization requirement says that the gathered information from individuals can only be used for the research and nothing else. The recorded data was stored in a private place and was later deleted.
Chapter 4

Results

This chapter will present the results from the course evaluation, questionnaires and group interviews. The quotes used are translated from Spanish to English, the original text can be found in the footnotes.

4.1 Course evaluation

Shortly after the participants had sent in their group projects and the course had been completed, a course evaluation was sent out. Out of the 27 participants, 23 chose to respond. All respondents were positive that the content could be used to improve their current work (22% "excellent", 52% "very good", 26% "good"). Learning about sustainability itself was not mentioned as much as learning the sustainability tools when the participants had to state the content that would be useful in their professional area of work. One participant specified the importance to integrate these tools by saying; "The theme is very much in line with the demands received at the centre. It is necessary to put into practice the proposed tools."[1]

The module 1, appeared to be ambitious time-wise. 48 % said that the course design and disposition was "good", and 30 % said it was "very good". However, most of the participants expressed the need for more time to learn the GVC and LCA methodologies. More practical examples together with interactive parts were requested to understand how the concepts worked and could be applied in their professional areas of work.

[1][Original text:] “La temática se presenta muy acorde a las demandas que se reciben en el centro. Es necesario poner en práctica las herramientas propuestas.”
The participants were positive towards the teachers and the given bibliography to understand the GVC and LCA methodologies further; 64% stated that the teachers were "excellent" and only 11% said that they were "good". The comments showed that the participants were pleased with the teachers that showed a lot of experience within the field, but again more time was requested so the teachers could instruct how to apply the methodologies in practise. One of those comments were; "Very good teachers, it would have been more useful to us with a few more days of workshop".

Overall the course evaluation shows that the module 1 was too short but that the participants expressed the importance and meaningfulness of the GVC and LCA methodologies.

When asked what the participants had learned from the course, they only responded with general descriptions such as "GVC and LCA". One participant chose to comment; "Upgrading innovations, all environmental concepts". However, the objective of the course is to also look at economical and social aspects of a product/service. According to the course syllabus, the goal of the LCA analysis is to address environmental impacts while GVC methodology is used to evaluate the socio-economic impacts. In this case, the participant only acknowledged the environmental impact.

### 4.2 Questionnaire to the course team

Both a pedagogue from INTI and a teacher at the university of La Plata answered the questionnaire seen in Appendix.

According to the teacher, the difficulty to finish the projects was due to "... the chosen subjects were not of their daily activities, many groups later did not find the data nor the time to continue with the exercises". The two group projects that were completed only made use of the GVC methodology, no one out of the five groups completed an LCA analysis. This was due to the insufficient quantitative data needed to com-

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2[Original text: ] "Muy buenos docentes, nos hubiese sido más útil unos días más de taller"

3[Original text:] Upgrading (mejoramiento)-innovaciones, todos los conceptos ambientales

4[Original text:] "En principio, como los temas elegidos no eran de su actividad diaria muchos grupos luego no encontraron los datos ni el tiempo para continuar con las ejercitaciones"
complete an LCA analysis. It would have required a further investigation to obtain it, the participants did not have that time available.

The teacher recommended the participants to begin completing a value chain map to understand the conditions of the investigated industry or process. This value chain map should indicate in which process/product it is most critical to carry out an LCA analysis. In the questionnaire, both the pedagogue from INTI and the teacher said that the participants thought it was difficult to work with the GVC part and that no one even had the time to do the LCA part.

Concerning how the participants are supposed to continue working with the GVC and LCA methodologies in their work, the teacher said: “It is important to consider that the course was to raise awareness. They are expected to take other courses or research on their own in the literature.” The pedagogue from INTI said that “The centre for industrial design doesn’t design themselves but provides courses and publishes publications, among other forms of dissemination, to develop more sustainable designs both for SMEs and independent designers.” While the course objective seeks to equip the participants with tools for sustainable decision-making and identify opportunities for design and innovation intervention, the participants themselves are instead supposed to apply their GVC and LCA knowledge by diagnosing designs or giving courses to SMEs.

Module 2 (group project) involved feedback mostly by mail explained the teacher. This resulted to be time-consuming for both the teachers and the assistants. The teacher proposed that module 1 should have a duration of at least five days to understand how the GVC and LCA methodologies can be applied to practical cases. This was because the course design and content were inspired from an existing course held at an Argentinean university where the students undergo five days of training. By increasing the duration of module 1, the tools used for GVC and LCA can be explained and the time-consuming feedback during module 2 can therefore be reduced. Another advice from the teacher regarding the feedback and support to the participants was that INTI should organize a call centre for specific cases re-

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5[Original text:] Es importante considerar que el curso fue de sensibilización. Se espera que luego tomen otros cursos o investiguen por su cuenta en la bibliografía impartida

6[Original text:] El CIDI – INTI (Centro de diseño) no diseña sino que imparte cursos y edita publicaciones –entre otras formas de difusión- para desarrollar diseños más sustentables, tanto a las pymes como a diseñadores independientes.
garding GVC and LCA questions. That was under investigation during this study.

4.3 Questionnaire to the participants

A survey was sent out to all the 27 course participants, six chose to answer the questions that can be found in Appendix C. The respondents possessed various previous knowledge of the GVC and LCA methodologies, two had worked with LCA before while the others possessed shallow knowledge. The reasons to take the course were therefore different. The persons with shallow knowledge said they wanted to acquire new tools or update themselves within the area. The persons who possessed previous knowledge only had so in one of the two methodologies. They said that they sought to learn both the other methodology and how they could complement each other.

The overall time the participants chose to spend after the two introduction days (Module 1) differed. Four participants explained that they had worked with the project (Module 2) for 2-10 hours in total and could not continue due to work priorities, lack of participating group members or lack of time. Two were positive that the course widens the view on the subject, but work priorities and lack of data made it difficult to integrate the GVC and LCA methodologies in their work. A third participant said that the GVC methodology would be possible to integrate such as creating a chain map of the different industries that are collaborating with the local INTI office. But applying the LCA methodology would be difficult due to the lack of data. A fourth participant, who already possessed previous knowledge in LCA and was working with it at INTI, found it hard to being able to integrate the GVC methodology. Not only due to the lack of knowledge of using the GVC methodology itself but also using it as a complementary methodology with LCA.

A fifth participant had invested 20 hours into the project but had difficulties finding the sufficient data for the project to be finished. However, the person still told about possible ways to make use of the content in the future by using both GVC and LCA to select projects, make direct investments and guide the training of human resources.

A sixth had spent almost 30 hours into the project and managed to make a chain map of two SMEs, analysing the maps and detecting
possible improvements regarding the technological vacancy and re-structuring the work organization. This participant not only finished the project given from the course, but also applied the GVC methodology on another SME to both map out the value chains and analysing the current situation. Applying the LCA methodology resulted to be both time-consuming and difficult to track the product performances or improvements. While this is a problem today, the participant’s local INTI centre is considering possible alternatives that can analyse a product’s energy efficiency, productivity, and environmental impacts. Five of the participants requested further training to learn the methodologies and applying them.

4.4 Group interview

This section is divided into several subsections, these correspond to how the interview questions were categorized (see Appendix D). The data collected from the first category, introduction, is used to describe the five participants for the two group interviews and can be found in chapter 3.3. Three participants took part in the first group interview and the other two participants in the last one, the results were gathered and are presented below.

Professional development at INTI

The five participants expressed that INTI offers better support to its members regarding the professional development compared to their own experiences in the private sector. A summary what the participant had to say regarding the professional development at INTI is shown in Table 2. The quantity and diversity of the courses helps the participants to grow within their own area as well as broaden its knowledge of relating areas. The work environment favours taking courses both internally as well as externally. Participating in national and international conferences is possible and scholarships can be given to study for a postgraduate degree.

Person E was currently enrolled in such an INTI scholarship and studied the last year of a post-graduate degree, which except for increased knowledge also allowed for cooperation with members of other Argentinean institutes. Person D explained that "... I tried to enrol in
a post-graduate career but due to administrative problems of the university, not INTI, I could not do it.\footnote{[Original text:] ... intenté hacer un postgrado afuera y por problemas administrativas de la universidad, no del INTI, no pude hacerlo}

The external courses that the industrial design centre wishes to take part of are listed in an annual plan that each centre proposes. If the plan gets accepted then the external institutions and organizations are contacted and contracted to hold the course(s). The interview revealed that in this case the studied course was part of the industrial design centre’s request for a GVC and LCA course that got accepted. Whereby the University of La Plata was contacted to provide and hold the course. Sometimes the annually plans can be declined due to high costs, accessibility, or time aspects. But overall all of the participants were very positive that they could influence their own professional development through course requests. The five participants showed optimism that INTI would continue to meet the industrial design centre’s request for future professional development in the GVC and LCA areas.

Every INTI member can apply to enroll in the internal courses, that are organized of other INTI members as teachers. It is up to the manager of each centre to accept if the person should participate in the internal courses or not. It is assumed that all INTI members take part of internal courses that relates directly or indirectly to their own work. Person B said that "in general there is a preposition, if you want to train in a subject at another centre and there are some relation to your work, the training is approved"\footnote{[Original text:] En general hay una preposición, si quieres capacitarse en un tema en otro centro y hay cierta vinculaciones a tu trabajo, se aprueba la capacitación}, which person A and C agreed upon.

Person D was positive that there were always relevant internal and external courses because of the two coordinators that works with evaluating the available courses and requesting new ones if needed. Each INTI member can also propose to teach a subject and can receive guidance from two pedagogues from the human resource (HR) centre. Both person A and B had experience receiving guidance from the pedagogues to hold their own workshops. Person B who works with LCA had held an introduction to LCA to the industrial design centre in Buenos Aires before. These types of courses within their own centre were appreciated, that allowed for sharing knowledge and created opportunities for teamworking. Person E had taken part of an LCA
project and had collaborated with LCA "experts" at INTI.

The difficulty to acquire real INTI cases that can be shown and used during courses is due to the bureaucratic structure of INTI, explained person A. An INTI member who want to take part of a course or post-degree program at a university is often restricted to fictive cases. person A says that using a real or fictive case "...is a lot of difference..." which sometimes can hinder one from completing the practical exercises given at INTI courses or post-degree programs.

Table 2: Categories of how the participants described the professional development in general at INTI.

<table>
<thead>
<tr>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wide range of courses</td>
</tr>
<tr>
<td>Broaden their knowledge</td>
</tr>
<tr>
<td>Continued training</td>
</tr>
<tr>
<td>Teamwork in centre</td>
</tr>
<tr>
<td>Teamwork between centres</td>
</tr>
<tr>
<td>Bureaucratic structure</td>
</tr>
<tr>
<td>Support to hold own courses</td>
</tr>
<tr>
<td>Support for university studies</td>
</tr>
</tbody>
</table>

Course design

The groups of 5-6 persons that were formed during the introduction days (module 1) were supposed to continue with the projects (module 2) from distance. The group members consisted of persons from different industrial design centres across Argentina which made the communication in the group restricted to email and group messages on the phone application WhatsApp. The five participants all stated that the communication in the group during module 2 was lacking, one reason was that several of the members were managers who did not find time to work with the project. Person B stated that their positions required dedication to other work tasks and therefore had small amount of time to dedicate themselves to the project. The communication between the groups and the teachers took place by email. All expressed their confidence for the teachers who always were available

\[\text{[Original text:]} \ Hay \ mucha \ diferencia\]
to give feedback. Only one participant said that the communication by mail with the teachers was difficult.

All five participants expressed that the large amount of content during the two introduction days resulted to be difficult to grasp. Person B said that “there was little time for all the content, life cycle analysis and global value chains. And then there was the idea that the participant should make a link between with tools and understand why one serves and why the other serves. That felt truncated due to the lack of time. It is as if I had just begun to approach what each thing was”\textsuperscript{10}. The previous knowledge that the participant had in LCA was not enough to both learn the GVC methodology and make a link between the two methodologies during this course. Person D also felt it was difficult to grasp the idea of the course, the instructions were not clear enough and the lack of a structured bibliography did not help to show how and where to begin. Person D said that reading the course syllabus “…took about an hour, and more and more of the information did not coincide with what the teachers had said…”\textsuperscript{11} in the end person D did not know exactly what was expecting from the project.

All groups began to work with the projects during the two introduction days and continued from distance. Finishing it resulted to be difficult due to the complexity and size of the project. Person A expressed that “…perhaps the project was very ambitious for our agenda and our work, I felt it was almost like a master degree course. Not a short course that can be taken in an institution”\textsuperscript{12}. The difficulty of this course had also not been communicated. Person E said that from what was communicated beforehand, it was supposed to be a two-day course and nothing more. Except from the size of the project, the participants also expressed the lack of cases and data to continue pursuing the work. Only

\textsuperscript{10} [Original text:] Era poco tiempo para todo el contenido, todo que tenía. Analisis de Ciclo de Vida, Cadenas Globales de Valor. Y después había la idea del uso del participante podría hacer un link entre ambas herramientas y entender porque sirve uno y porque sirve otra. Y eso quedo medio truncado por la falta del tiempo. Es como recién pudiera a empezar a aproximar qué es cada cosa.

\textsuperscript{11} [Original text:] La consigna era muy, de hecho, leer la consigna, leerla entera llevaba una hora aproximadamente leerla era una hoja completa y cada mas no coincidiera con lo que dijo parecido. En un momento dicen que había cambiado o no hubiese estado acuerdo con las partes o no, le faltaba a mí entender una vuelta a la consigna, lo que se pedía el trabajo.

\textsuperscript{12} [Original text:] Claro, quizás era muy ambicioso el trabajo practico y para nuestra agenda y nuestra cantidad de trabajo, yo lo sentí que era una materia de maestría. No como un curso de poco tiempo que se puede tomar en una institución
person C’s group finished the GVC part of the project which person C explained was due to one of the group member’s previous knowledge and dedication to the project. All the other members sent data and information to the group “expert” who completed the value chain. Person C said that the found data was informal, finding references was difficult and would be even more difficult if they would have started working with the LCA methodology. The participants said the lack of former case studies and SMEs to directly work with made it difficult to find real data. All four participants who did not finish the project studied the material and began working with the projects, but could not finish them due to lack of relevant cases, data and enough time for all group members to work with the project. Person D and E discussed that the lack of specific deadlines downgraded the project, other work tasks had higher priority. Therefore, little time was prioritized to continue work with the project after the two introduction days. Explicitly what the participants stated about the course design can be found in Table 3.

Table 3: Categories of how the participants described the course.

<table>
<thead>
<tr>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time module 1</td>
</tr>
<tr>
<td>Excessive course content</td>
</tr>
<tr>
<td>Excessive project</td>
</tr>
<tr>
<td>No structured bibliography</td>
</tr>
<tr>
<td>Lack of communication with group</td>
</tr>
<tr>
<td>Communication difficulties with teacher</td>
</tr>
<tr>
<td>Lack of cases</td>
</tr>
<tr>
<td>Lack of data</td>
</tr>
<tr>
<td>Lack of deadline</td>
</tr>
<tr>
<td>Lack of clear instructions</td>
</tr>
<tr>
<td>Interesting content</td>
</tr>
<tr>
<td>Interesting professors</td>
</tr>
</tbody>
</table>

Participants knowledge of GVC and LCA after the course

Person A said that their group began to work by mapping out a value chain over a previous INTI project that they did not finish, no LCA methodology was used. Due to the amount of information needed
to be analysed to carry out the project, GVC seemed to be easier to work with than LCA. The participant had some prior experience with using GVC results, but not actually making an own value chain map before. Working with the methodologies after the course would be difficult because the project was not finished. No group managed to complete both the GVC and LCA part of the project, however they all expressed the complexity of the methodologies that required exact data and information. All five participants were positive that learning them better could be possible if real data was available. They said that the centre should continue to collaborate with the teachers from the University of La Plata.

Person B who is part of the sustainability area at the industrial design centre in Buenos Aires works daily with LCA to technical assist SMEs. The group decided to work with the GVC methodology, but could not finish the project due to other priorities of the members and lack of data. When asked if any notable changes had been noticed regarding how they work with the methodologies after the course, the response was that nothing had changed. Person B’s knowledge of GVC was superficial and doubted the possibility to make a link between GVC and LCA. Person B explained that GVC “…seems more like a tool for state policy than for the private sector”\textsuperscript{13} and that the industrial design centre “have never used it as a technical assistance”\textsuperscript{14}.

Person C had no previous knowledge in the GVC nor LCA methodology except from reading a random article where it was mentioned. Still the group managed to finish the GVC part of the project, which person C explained was because they had an "expert" in the group. The group had to find data and information that was sent to the "expert", but person C did not take part of the designing of the value chain map. Because of the problems finding correct data during the project, person C doubted the possibility to successfully work with GVC after the course.

Both person D and E had worked with projects before the course that had included LCA, but they had never worked directly with these methodologies. Instead they had worked with the recommendations based on the results from LCA analyses. Before the course, they had participated in person B’s workshop where the methodology was ex-

\textsuperscript{13}[Original text:] Parece más una herramienta para política del estado que para el sector privado.

\textsuperscript{14}[Original text:] nunca lo hemos usado como una asistencia técnica
plained, however they stated that their knowledge was only superficial and with no hands-on experience with LCA. Regarding their knowledge with GVC, person D said "I did not know anything of global value chains before the course, and now I know a little", which person E agreed upon.

All five were very positive that the course content can be useful for the industrial design centre. Everyone could explain what differed between the methodologies, possible applications, and outcomes from using them. However, the lack of hands-on experience designing a value chain map or life cycle inventory during the introduction days made it difficult to finish the projects and to see how they could be used in their work. Person A said that to learn the methodologies, the participants should be able to finish the project, and keep working with the teachers from the University of La Plata. Except from learning each methodology, person B said it was also difficult to understand how the GVC and LCA methodologies could be used together in their normal work. The five participants said that case studies and working directly with SMEs or municipals could make it easier to achieve real data and understand how the methodologies can be applied and used in their work. After the course, no one felt secure to individually carry out a GVC or LCA study, except for person B who already worked with LCA.
Chapter 5

Analysis of results

This chapter will analyse the results based on the theoretical background to answer the thesis’ two research questions. Section 5.1 analyse the results that are related to the first research question of this thesis; how do the organisation support the participants to learn the GVC and LCA methodologies? What obstacles and opportunities are there for understanding and reasoning about the GVC and LCA methodologies?. This section will be analysed with the help of the 15-factor framework, together with the theoretical framework if the factors are not enough to understand the learning within INTI. Section 5.2 analyse the results that are related to the second research question; how does the participants choose to integrate the GVC and LCA methodologies into their work and what are the challenges when doing so?

5.1 Professional development at INTI

The found factors that facilitate professional development at the industrial design centre in INTI are summarized in Table 4 that is based upon the framework shown in Section 2.3.2. What can be said is that several of the factors are represented at the centre, either fully or to some extent. The factors found not to be represented was a flexible organizational structure (factor 12) and transparency (factor 13). The analysis of the 15 factors is explained below:
CHAPTER 5. ANALYSIS OF RESULTS 45

Factor 1: Experimentation, new ideas, continuous improvement, rewards, openness to change

The industrial design centre works closely with SMEs and continuously looks at the market for how the centre can adapt itself. Training in different subjects, both internally as externally is common for INTI to adapt to the changing environment. INTI works to receive the requests from its members, the course team said that the investigated course was suggested by members from the industrial design centre. The INTI members’ empowerment over their own professional development creates a usefulness of the content for the learner which is advocated by Dewey [1997]. Also, INTI facilitate its members to educate themselves through scholarships and offering courses, which the participants highlighted during the group interview. How these actions for professional development are followed up often results in an evaluation shortly after the courses. The participants said that no other evaluations or follow ups are made that investigates the utility of the course itself.

Factor 2: Observation, openness and interaction with the (uncertain) environment

INTI both works with other institutes, municipals, SMEs and universities during investigations and educational events (see Chapter 1.2). This cooperation makes INTI constantly interacting with its environment. Which according to Lave and Wenger [1991], is important to understand the community of practise and how INTI members can acquire knowledge. The participants said during the group interview that the course was requested because both municipals and SMEs wants to be a part of the existing global value chains.

Person E could explain an example how INTI can interact with other institutions. The person had received a scholarship to study a post-degree course, that allowed for cooperation with members from other Argentinean institutions during a course project.

Factor 3: Mistake and risk acceptance

The methodology of this study makes it difficult to investigate whether or not INTI accept risks and mistakes. Partly it can be analysed based
on the investigated GVC and LCA course. It included excessive content, the duration for the workshop had been reduced from five to two days, all group communication and feedback from the teacher was distance based. These conditions proposed a risk that the course could not work as intended. As stated several times earlier in the report, the course participants had major difficulties completing the course because of these conditions. However, the responses from the questionnaire and group interview showed that the participants wished to continue to learn the methodologies. The course team also explained that the course was only an introduction and that it was expected to follow up with future courses. The conditions that led to only two finished projects had been identified and reflected upon. The course team was now looking forward to continuing the professional development in the GVC and LCA but under new conditions. This somehow demonstrated INTI’s risk acceptance.

**Factor 4: Heterogeneity, diversity**

The institute has a strategy to work towards heterogeneity and diversity. INTI has 52 centres with multiple R&D areas across Argentina which includes all mayor regions of the diverse country (see Chapter 1.2). The institute also cooperate with international universities, having student completing part of their advanced study projects (such as master theses) at the INTI centers.

The several areas of INTI can choose to participate in courses that does not have to be directly related to their work, the group compositions during the courses can therefore be diverse. The course participants explained during the group interview that this diversity created interesting debates and exchange of views. These social contributions from different persons has an important role for the learning processes (Vygotskij, 2001).

**Factor 5: Dialogue, communication and social construction**

INTI with its 52 centres in Argentina shares both R&D projects, courses and developments. The communication between centres often take place by mail or phone, Rosso (2017) explained that the uncertainty of the internet in some regions can sometimes make it difficult to make
video chats. The communication between the different areas is common, with e.g. interconnected projects (such as the industrial design, environmental and HR centres working together to carry out this studied course). In this social context, the centres can learn from each other according to the theory of Vygotskij (2001).

However, based on the result from the studied GVC and LCA course, there was not one specific responsible for this course. The course team are the professors from the University of La Plata, and the pedagogues from the HR centre. While both are proficient in their area, there were no specific course representative who worked as an intermediary between INTI’s interest and the knowledge of GVC and LCA. The course was therefore not designed based on the INTI participant’s perspective, but instead a remake from a university course based on the perspectives of university students. This resulted in misunderstandings, person E was just expecting a two-day course and not a two-month long project while person A felt like the project could be of a master degree course and not an introduction course at INTI.

**Factor 6: Continuous training**

Continuous training is supported at INTI, with individual yearly study plans for both internal and external courses as well as possible scholarships to study at universities. All participants during the group interview were positive to the quantity of courses and that it is expected from INTI that everyone should take part of courses. Person B had received support from INTI to hold an own LCA workshop that the HR area approved. The continuous training take place with a mix of these ways to learn, and with the delegation of power to each INTI centre to form their own workshops as well. The more personalized training puts the individual in focus, Piaget (2008) means that it is important because everyone has their own understanding and need for different learning contexts.

The course does not show that the participants received continuous training. They had two days of workshop and were then supposed to complete a project on their own with distance based feedback. Also, person D stated that the course did not have a part that summarized the outcomes of the groups nor the experiences from working with the GVC and LCA methodologies. The lack of closer interaction with other groups and the teachers can hinder the participants to go beyond
their own potential understanding, what Vygotskij (2001) refers to as the ZPD.

**Factor 7: Delegation and participation (empowerment)**

INTI is bureaucratic (see Factor 12 below) which can affect the empowerment of the members regarding finding relevant data. This is common when trying to find cases for courses, such as the GVC and LCA course where the participants did not receive access to real cases. Every group had the same problem which was one of the main reasons that they could not continue with the projects. One of the groups that finished the GVC part had to invent data because they did not receive access to the real one. According to Dewey (1997), the knowledge should be directly useful to the learner which it was not. One of the participants who had finished the GVC part of the project criticized the usefulness of the result because the data was not real.

Regarding the delegation of who decides how to develop professionally at INTI, the organization do empower its members to choose their own courses and the members can decide which kind of courses INTI should add. This can create a personal interest to commit to the courses, which is important for the assimilation and accommodation processes of learning according to Piaget (2008).

**Factor 8: Teamwork, importance of the group, collective spirit, collaboration**

During the group interview the participants expressed that their industrial design centre in Buenos Aires had a lot of projects that required teamwork. Also, several projects can include teamwork between areas, such as the studied course where the industrial design area worked together with the environmental and HR area. This teamwork can increase the collective understanding and can overcome learning difficulties based on the theory of Vygotskij (2001).

There exist collaborations between different INTI centres (such as the industrial design centre in Buenos Aires and Cordoba). It all depends if the area of expertise shares the same interest and objective as in another geological location. For example, during the GVC and LCA course, the participants came from all over Argentina and the groups consisted of persons from different centres. Both the participants dur-
ing the group interviews and Rosso (2017) expressed that it is common that INTI promotes these exchanges.

**Factor 9: Workers who want to learn and improve**

INTI offers several courses that are either directly or indirectly related to a member’s area as well as possibilities to receive scholarships to study at universities. These opportunities are frequently used, e.g. person E managed to study a post-graduate degree and the other participants mentioned other co-workers that had used this opportunity as well. Not wanting to learn and improve is something uncommon among the interviewed participants.

**Factor 10: Leadership committed to learning**

The opportunities to take courses and develop professionally is common among managers as well. During the GVC and LCA course, several of the participants were managers from across Argentina. However, due to their obligations, there were not a lot of time to work with the project after the course. While the managers do seize the opportunity to participate in courses and congresses, not as many prioritize the subsequent projects to fully commit to the learning. This is actually crucial for the learning processes according to Illeris (2007). Learning is not a transfer of information, it requires the participants to analyze and work with the GVC and LCA methodologies it to understand them.

**Factor 11: Learning as an essential element in the strategy (measurement)**

Learning and professional development at INTI is prioritized, with several ways and opportunities to increase the competence. There is a strategy to improve the existing courses by reviewing the centre’s needs at the end of each year. The result can be new courses, such as the GVC and LCA course. Taking a course requires the INTI member to motivate the manager why it is relevant as well as filling in a form what he/she has learned after the course. Except from that, the courses often end with a questionnaire where the participants can rate it and answer some questions. However, none of the participants during the
group interview said that latter follow-ups regarding what they had learned or implemented takes place.

**Factor 12: Organizational and managerial structure not very hierarchical, and flexible**

INTI is a very stable workplace where many of its members work until they retire. Achieving a manager position can take up to 15 years, therefore the managers choose to stay at their position for a long time. This has created strict hierarchy and bureaucracy. Several participants said during the group interview that the lack of real cases for courses is common due to the strict bureaucracy. Now there are actions taken to making INTI less bureaucratic in order to improve the processes and the delegation of power.

**Factor 13: Knowledge of the organization’s objectives and strategies, ready access to information (transparency)**

The INTI centres are designed differently at each location, in Buenos Aires each area has its own building who are located close to each other. This can restrict the informal communication to each area. However, each area works to bring forth their results in papers, taking part of congresses and holding courses. Because of the openness when taking internal courses, each member has the possibility to access how each area has progressed and view their results.

However, the public procurement within INTI has not been as transparent. The objectives and strategies of INTI can change because of its role as a federal agency. Since Mauricio Macri became president in 2015, he introduced Javier Ibañez as president of INTI which has created controversy. Cases of corruption has appeared in the media where Javier has facilitated manoeuvres of diversion of funds from the INTI to an association composed of the same employees of the agency. This attacks the interests of the Argentinean state and INTI itself (Eiriz, 2017).

**Factor 14: Sense of humour**

Due to the method of how this study was conducted, it is difficult to analyse if there exist a sense of humour or not at INTI. During the
group interviews, all the participants were open with their feelings and joked around which is a positive indicator.

**Factor 15: Improvisation, creativity**

The participants of the GVC and LCA course worked at the industrial design area, an area closely related to creative tasks. However, the members do not work with their own designs but instead has a supporting role to SMEs, organizations etc. Nevertheless, INTI supported the industrial design centre to approve its request to learn the GVC and LCA methodologies. The professional development at INTI is often formed based on requests from its members. This mindset to empower the members to design the professional development may favour creative thinking within the institute.

Table 4: Factors that facilitate organizational learning at the industrial design centre in INTI. "Yes" = the factor can be found; "Some" = the factor can partly be found; "No" = the factor cannot be found; "No data" = not enough data to assess if the factor can be found or not

<table>
<thead>
<tr>
<th>Factor</th>
<th>INTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Experimentation and change</td>
<td>Yes</td>
</tr>
<tr>
<td>2 Interaction with the environment</td>
<td>Yes</td>
</tr>
<tr>
<td>3 Risk acceptance</td>
<td>Some</td>
</tr>
<tr>
<td>4 Diversity and heterogeneity</td>
<td>Yes</td>
</tr>
<tr>
<td>5 Communication</td>
<td>Some</td>
</tr>
<tr>
<td>6 Continuous training</td>
<td>Yes</td>
</tr>
<tr>
<td>7 Delegation and participation</td>
<td>Some</td>
</tr>
<tr>
<td>8 Collaboration and rivalry</td>
<td>Yes</td>
</tr>
<tr>
<td>9 Motivation</td>
<td>Yes</td>
</tr>
<tr>
<td>10 Leadership committed to learning</td>
<td>Some</td>
</tr>
<tr>
<td>11 Learning is important of the strategy</td>
<td>Some</td>
</tr>
<tr>
<td>12 Flexible organizational structure</td>
<td>No</td>
</tr>
<tr>
<td>13 Transparency</td>
<td>Some</td>
</tr>
<tr>
<td>14 Sense of humor</td>
<td>No data</td>
</tr>
<tr>
<td>15 Creativity and improvisation</td>
<td>Some</td>
</tr>
</tbody>
</table>
5.2 How the participants use the methodologies

After the course the participants felt that they had only been introduced to the area, they had not acquired the necessary knowledge to independently carry out a simplified LCA or value chain map. Working independently with the methodologies was not an option. The interviewed participants instead expressed that the current knowledge is enough to understand the basics of GVC and LCA. The results from the questionnaire and group interview show that the participants did not reach the aim for the course, to carry out a value chain map and a simplified LCA as well as being able to make decisions based on the results. However, all the participants expressed their own interest to learn the methodologies, which is important for the learning based on the cognitive perspective on learning. Several challenges have been identified when learning GVC and LCA from this course at INTI which are explained below.

Excessive content

The course evaluation, questionnaires and group interviews are all pointing to the same thing. The quantity of content to be presented and completed for the project was excessive for the two days of workshop. To work with GVC requires an understanding of the market, possible trainings, collaborations, and possible finance (Gereffi and Fernandez-Stark, 2016). And to work with simplified LCA requires an understanding of the LCA tool, creating guidelines and strategies as well as convincing SMEs to embrace LCA. To learn these complex methodologies requires time to assimilate and accommodate new information as well as critically reflect upon it, time that was not enough. The two-day workshop (module 1) included both lectures as well as hands-on training. But with too short of time dedicated to what Dewey (1997) refers to as learning by doing, the course design obstructed the social interplay between the participants and the methodologies. The participants only had a superficial understanding and short experience from working with the methodologies, which was not enough to continue working with the complex project on their own. By not letting the participant begin with simple tasks and continuously working with more difficult ones can interfere with the learning according to Lave and
The five participants explained during the group interviews that they were not expecting the excessive content from this course. They entered with a mindset of taking a two-day course, not carrying out a project for what person A would categorize as a master’s degree course. The course was originally adapted from the University of La Plata but the project was not re-designed. Only the original five-day workshop was shortened to two days. Carrying out a GVC or LCA study do take time because of its complexity, but several of the participants did not find time to work with the project. The motivation to learn GVC and LCA can be lacking if the participants do not have the prerequisites for such a complex project. Piaget (2008) says that the learning is constructed based on the existing schemata and understandings. The participants had challenges to carry out the project because their current schemata of GVC and LCA were not sufficiently well-grounded to accommodate or assimilate the project’s tasks.

The idea with the course was also to understand the relation between GVC and LCA as well as how they could be used together. Person B who was the only one with prior good understanding of the LCA methodology questioned how this could be possible. Except from learning each methodology separately, the participants were expected to make a link between them two. This is only possible by first having an existing understanding or schemata of GVC and LCA; and then expand these. In this case the schemata of GVC and LCA had not been established to make this link between them two possible.

**Unclear aims and objectives**

The course team explained that the course was supposed to only introduce the participants to the GVC and LCA methodologies. The aim of the course was however to carry out a value chain map and a simplified LCA as well as being able to make decisions based on the results. These differences in the aims and objectives affected how the course was presented. Person D explained that the presented content sometimes was not reflected in the course syllabus. Working with the project from distance was therefore difficult because of the unclear aim and objective said both person D and E. When adopting a university course to an institution such as INTI, the student profiles changes as well because of different prerequisites and obligations. The course
and its learning activities should be designed with the specific learner in focus, according to Ertmer and Newby (1993). In this case the aims and objectives did not change when the course was adopted, while the course is held at INTI it is still designed for a university student.

**Working from distance**

The project groups were designed so that everyone had not met each other before. In almost all groups everyone worked at different INTI centres across Argentina. Due to this condition, the groups chose to communicate by mail and phone. All participants during the group interview were positive to the exchange of thoughts, but that the lack of communication between its members made it difficult to carrying out the project. The mail conversations resulted to be excessive as well as difficult to find solutions due to the large groups of 5-6 persons. Several course participants were managers who had difficulties finding time working with the project group. The groups tried to work from distance, but the only ones who managed to complete the GVC part of the project already had an "expert" in the group who already worked with the methodology. Having a more knowledgeable person can increase the group’s zone of proximal development to go beyond its own conceptual understanding of GVC and LCA. However, person C explained that the group members just had to send the necessary data to the "expert" that worked with the methodology.

The groups were positive to the communication between the group and the teachers. They were always available for answering questions. However, one of the teachers explained that there were many questions and that he/she had difficulties keeping up answering them all. A teacher is also a more knowledgeable person, that can support the participants to understand the abstract concepts. But the absence of direct discussions with the teachers restrict the exchange of ideas. Person D and E said during the interview that they desired to discuss with someone who could help them understand how to continue based on their finding and lack of data. Because both the teachers and group could only be contacted from distance, these in-depth discussions did not take place. Actually, the learning processes are more important than the outcomes according to the situated learning perspective, the restrictive communication to mail scaled down the community of practice in where the belief and understanding are acquired.
Vygotskij (2001) state that the environment affects the learning, if the participant feels excluded from the social learning processes then it is challenging to appropriate the knowledge.

**No real cases and lack of data**

After the two days of workshop, all participants returned to their respective INTI centres where the groups began to search for data and information related to completed INTI cases. But this information was security classed, so instead the groups had to make up fictive cases with fictive data. Several groups found it difficult to continue due to the lack of real data, even with the support from the teachers. Person C’s group who completed the GVC part of the project had to use fictive data, whereby the results from the analysis was questioned within the group. The lack of data and possible manipulation of the data to receive specific results has been one of the criticism towards system analysis tools such as GVC and LCA, which also person B mentioned during the interview (Seidel et al., 2009; Thomas and Jan, 2007; Gaines and Stodolsky, 1997).

If the group must work with fictive data, there is also a concern regarding the usefulness from working with the project. Completing just the GVC part of the project took 2-3 months for the two groups who finished it, for participants who have other obligations at INTI. The pragmatism talks about learning by doing, the learning activities should be related to the reality of the participants to give utility for the learner (Dewey, 1997). If the data is not real, then the participants will not feel motivated to work with a 2-3 month long project that cannot be used in their work. One of the professors said that one group did use real data from an INTI case and continued to work with the project after the course. According to Lin et al. (2012, p. 12), the participants should use simplified quantitative data when designing a LCA analysis. However, in this case the groups had difficulties to find any data.

**Diverse group constellations**

The groups consisted of 5-6 persons from different centres across Argentina but also with different interests. When the groups were formed they had the task to decide a product or service they wanted to analyse
with the GVC and LCA methodologies. Coming up with a case that was important to all group members was difficult. Person D and E said that when the groups finally had decided, the case was directly beneficial to the "case owner" but not necessarily to all group members. The knowledge will not be as useful to the learner if it is not related to its reality says Dewey (1997). If all members of the group are convinced of the benefits of the project, the shared contributions can contribute to increased learning (Vygotskij, 2001).

**Diverse class composition**

The 27 course participants had different backgrounds, such as managers, sustainability experts or industrial designers. This diversity was positive to the interviewed participants because of the exchange between different INTI members. This created a more diverse social interplay, that can bring forth different cultural and social artefacts for the participants to appropriate the GVC and LCA knowledge based on the theory of Vygotskij (2001). However, during the group projects several of the participants did not find the time to work with the project after the two days of workshop, especially the managers who had many high priority obligations. To learn how to successfully make either a GVC or LCA analysis is a time-consuming process. The utility of the course content must be taken in consideration according to Dewey (1997), all participants said during the evaluation that they wanted to understand how a GVC and LCA analysis can be conducted, but not everyone was going to work directly with conducting these analyses.
Chapter 6

Discussion

The aim of this study was to investigate how INTI was supporting its members of the industrial design area to use GVC and LCA methodologies as an approach to assess SMEs. The study looked at a case study based on two different approaches; how the work and learning processes after a specific GVC and LCA course turned out, as well as how the professional development at INTI support its members to learn the GVC and LCA methodologies at the industrial design area. Based on the analysis of results, INTI showed several factors that facilitates the professional development while the course had several aspects that created learning difficulties for the participants. Each research question will be discussed below.

6.1 Professional development at INTI

The first aim of this study was to investigate how INTI was supporting its members of the industrial design area to use GVC and LCA methodologies as an approach to assess SMEs. Based on the analysis of results which are summarized in Table 4, INTI showed several factors fully or to some extent that facilitates the professional development. The flexible structure (factor 12) is not represented which resulted to hinder the participants to receive access to data and information. In this case the lack of accessibility directly affected the participants to find data to complete the GVC and LCA project. INTI can facilitate the professional development for its members, but if they do not receive the tools to work with the given exercises then that problem should be addressed. INTI should look at possible actions to let future par-
participants access data and reports from real projects with SMEs in Argentina.

Learning is an essential part of INTI strategy (factor 11), but the lack of measurements prevents INTI to understand the learning outcomes from the courses. Measuring professional development is not achieved by only providing courses, but requires an understanding if the INTI’s members achieve the course objectives. In this case, the result from the GVC and LCA course became obvious that the majority of the participants did not achieve the course objectives. But the course evaluation is not enough to address the course conditions and how to measure their understanding. Based on the results from this study, a more excessive follow up of the participants after the course is recommended.

The 15-factors are not a definite explanation but instead an indication how INTI support its members with their actions. Not receiving the sufficient data due to bureaucracy cannot be compared with other factors e.g. having a sense of humour (factor 14). The factors that are not represented or only to some extent can instead be possible improvements, where some are more critical than others. Some of the factors (14, 15) were difficult to measure in this type of study, but can be discussed whether it is important for the professional development at INTI. These two factors were only represented in one of the eight references used to design the 15-factor framework created by Chiva-Gómez (2004). While several factors create a richness, it is problematic if all contribute to the professional development of an organization. Workers who want to learn and improve (factor 9) can be criticized for being an obvious reason for professional development. Identifying factors at an organization should instead look at the conditions that motivates the members. Continuous training (factor 6) can contribute to an individual’s professional development, but is not defined properly. Enrolling in several GVC and LCA courses could be identified as continuous training, but it does not necessarily indicate that the participant is learning continuously. The framework with 15-factors is not enough to address the complexity of learning and needs to be substantiated with relevant learning theories.
6.2 How the participants use the methodologies

All the participants showed a continuous interest to learn the methodologies after the course even though no one managed to complete both the GVC and LCA part of the project. Several challenges were found based on how the participants in this case study experienced the investigated course. The excessive content based on elusive aims and objectives show that courses for institutes such as INTI needs to be defined with the members in focus. A university course cannot only be copied but needs to be adapted to the INTI participants. The course has been adapted to some extent, but the lack of transparency of how the aims were represented in the content created challenges when trying to learn the methodologies. The course objectives can be questioned if it is reasonable that one course should include both GVC and LCA methodologies. Several participants questioned this during the group interview, that they only had superficial understanding of the methodologies. The groups who finished the GVC projects had "experts" who finished the tasks, which questions if those who did not have prior experience learned the processes of designing a value chain map.

Working from distance gave rise to communication difficulties within the groups when trying to figuring out the project and its diffuse instructions which hindered several groups to continue. It is optimistic that two days of workshop will create the basic to start working with the methodologies from distance and communicate with a new group. The course team responded by saying that the module 1 should be changed to five days instead of two which is well needed. This study would argue that learning to design a value chain map and life cycle analysis requires first-hand experience of mapping out all the parts and processes. Learning theories such as the pragmatism, situated learning and cognitivism argue that the learning activities should be focused around the learner. With the current course design, it is difficult to achieve this because it is easier that all group members send the data to one person that designs the value chain map and LCA. This is facilitated due to the relative large groups of 5-6 persons, that does not have the possibility to group up except from distance based communications.
After finishing the courses, it is expected that the participants will work directly or indirectly with the GVC and LCA methodologies in their work. But the lack of real data and cases during the course did not prepare them to work with the methodologies enough. In this case several of the group could not even finish their projects but also those who did finish had to use fictive data. The course should prepare its participants to both learn how to use the methodologies but also how to apply them in real case scenarios. It is recommended that the course team prepare real cases with real data for the participants.

6.3 Reflections over the research process

The main critique towards this study is that no observation during the two-day workshop was possible. This would have added a richness to the data collection and analysis. Especially because one of the problems mentioned during the group interview was the irregularities when comparing the course plan with how it was presented. Some content had been removed in the instructions but was originally mentioned in the course curriculum. This could have been analysed better if the author of this study would have been present during the two day workshop. However, the lack of participation during the two day workshop was compensated by several resources to understand both the course execution and its impact.

6.4 Conclusions

- INTI has a well-organised system for promoting professional development within the institute, but its bureaucratic structure prevents direct access to specific data and information that is important in order to work with the GVC and LCA study projects.

- The absence of follow-ups to measure the impact of courses can impede the professional development within the GVC and LCA area.

- The participants are given no or little hands-on training with the GVC and LCA methodologies together with the teachers. The distance based project creates an disproportional work burden on a few group members, preventing everyone in the large
groups to learn how to use the methodologies. Whereby they do not receive the necessary confidence and understanding how to work with the methodologies on their own.

6.5 Suggestions

- **Case studies and data.** All participants stated the same, the lack of access to real data prevented them from either getting started or to continue with their projects. The course team should find case studies or initiate collaborations with SMEs for this course so the participants can easily get access to real data.

- **Specific course owner.** It is not enough to change a university course from 5 to 2 days of workshop, the content and its objectives should be examined by someone who understands the methodologies and how they are used at INTI. The course team that consists of a pedagogue from INTI and two teachers from the University of La Plata should have a specific course owner. Someone who have good understanding of the GVC and LCA methodologies, and that works at INTI. The course owner would have the function of being an intermediary between INTI's interests and the complex areas of GVC and LCA.

- **Divide the course into two.** Each of the two methodologies are complex and difficult to complete. If the objective is to complete a value chain map and a life cycle analysis, the suggestion is to separate the course into two different ones. One course with GVC content and one course with LCA content. The participants would receive more hands-on training during each of the workshops.

- **Enlarge the module 1.** The two-day workshop was ambitious for the content of the course. It should be at least of the same length of five days as in the original university course. However, university students may have more time to finish the project on their own while INTI members are obligated to work with their other tasks. The result from the investigated course showed that some participants did not have the time to work with the project because other work tasks were prioritized.
• **Different course difficulties and objectives.** Several of the participants in this case study were managers who are not expected to work on their own with designing GVC or LCA studies. It is suggested that INTI should offer a simple GVC and LCA course that is designed based on the needs of the managers. Present a course with pre-designed cases with all data available, where to focus is to understand the results from the completed value chain maps and life cycle analyses instead of conducting their own analyses. The investigated course should remain but be given to participants who are expected to work deeper with the methodologies.
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Appendix A

Syllabus

Overall aim of the course

The conceptual basis that Sustainable Innovation proposes "is not limited to the environment but to all those aspects that affect the means of production, such as the living conditions of workers, improvements in industrial design systems, the relationship with users and the institutionally of the productive apparatus, among others". In turn, it is observed that "there is little knowledge in the vast majority of SMEs about how to reduce the environmental impact of their production during the different stages of the product life cycle" and that "the road to a low emissions system of carbon requires transformations in professional profiles and ways of working". In this sense, the proposed developed here considers that to advance in the path of innovation, design and sustainable production it is necessary to integrate the three phases: economic, environmental and social. For this, it is necessary to articulate the Life Cycle Analysis (LCA) methods with Global Value Chains (GVC) and work them in parallel, as a prerequisite to any project design or territorial planning task. The two methods operate as tools for analysis in the first instance, and for management in a second. While the LCA provides tools to prioritize the environmental requirements that the artifacts and their manufacturing processes must have; GVC serves to analyze where to intervene, for what, for whom it is and to evaluate the socio-economic impact of the productive chains in the territories. It seeks to equip attendees with practical tools for decision-making based on the articulation of micro-

1[Note:] The syllabus has been translated from Spanish to English
macro perspectives, from the product level to the territory, to reduce resources and energy, to minimize the different footprints (hydro, carbon, ecological) and identify opportunities for design and innovation intervention. The expected objective is to increase equity, reduce footprints and improve economic performance, both at the level of productive units and in supply chains and their local impact.

Disposition

- Two days are available. In the mornings two theoretical classes will be taught for 2 hours each and in the afternoons the practical activities will be carried out.

- Topics will be taken on specific projects and interests of the participants, of which most of the data and variables are known.

- The privacy of personal data and signatures will be maintained unless permission is obtained from them.

- As far as possible, topics related to items, chains or specific productive areas will be previously stated for the best organization of teachers.

- If the works are not completed in term, after the conclusion of the seminar all the groups will have additional corrections via internet.

- It is suggested to pick products and simple chains.

- Depending on the themes and/or projects concerned, the methodologies will be worked on individually or in a particular way.

- In the end, the confluences and articulations between all the methodologies will be worked out.

- Graphic formats will be used if needed.
Module 1

Day 1. Sustainable perspective in the Global Value Chains

Theoretical foundation

"Global value chains encompass the full range of activities required to create a goods or service, from conception to the different stages of production - provision of raw materials, input of various components, subsets and product services, assembly of finished goods - to the delivery to final consumers as well as disposal after use" (Cattaneo et al., 2010). This methodology allows to track multiple issues in a chain (Kaplinsky et al., 2002), for example: slave labor, child labor, woman’s wages, hours of work, benefit sharing, power and control, among other data. Its analytic reach is now embedded in other broader methodologies such as Social Life Cycle Analysis (SLCA), Sustainable Innovation (SI), Supply Chains (Global Value Chains), among others. The application of the Global Value Chain analysis used as a diagnostic tool makes it possible to detect the most vulnerable links and concentrate the greatest efforts of government design and support. It is effective in deciding where to allocate resources, identifying innovation niches, avoiding adding value to groups that do not need it, knowing when to recommend participating in a given chain (depending on who pulls it and the weaknesses or opportunities it offers) or when to put together a plot of value on the categories of the social economy or solidarity (Caracciolo, M. 2012).

Content of day 1

The theoretical agenda held during the morning will include:

1. Design for social impact. Different social approaches in design and production. The social part in the Global Value Chains.

2. Chain and Plot Concept.

3. 4 Key parameters in any production chain

4. Different types of chains: "pushed by the producer" or "driven by the buyer".
5. Power and control (Governance)

6. Global Value Chains and Local Development

7. Proposals for Improvement vs. Impoverishing growth

8. When it is convenient to join a Global Value Chain. Case Studies of chains in Argentina


10. Identification of risks against social, economical and environmental sustainability.

11. Objectives, monitoring and follow-up.

**The objective of the workshop:**

- Familiarize the Technician / designer in the detection of sustainability problems and their treatment, based on the articulation of the micro-macro perspectives offered by the methodology of Global Value Chains

- Facilitate decision-making and the formation of the necessary consensus to achieve a comprehensive approach to sustainability.

**The workshop agenda held during the afternoon requires the participant to read to attached bibliography and work with the following tasks:**

1. Describe the main chains operating in your territory. Insert your product or project in a global, national or local chain of specific value. (Even if your project participates in many chains, define its priority chain)

2. Carry out the chain map. Graph the link and visualize which link corresponds to your project, show where your project is located at least locally in the chain map. Observe how companies are articulated, flows of goods and services, transport, incidence of the economic factor and local government, regulations, possible strategic alliances. (See Page 52 of Kaplinsky’s Manual, start with a simple diagram and expand it as you get or integrate more data into each link)
3. Detect problems in the chain, from the point of view of design, as well as productive processes, social organization and marketing. E.g. assembly of links, stagnation, emergence of new elements, lack of adequacy in delivery times, lack of quality in certain sectors, lack of training, equipment renewal, maintenance, process safety, seasonal continuity, etc. (Note these factors in the most convenient way, in the form of text, as a list, as sections, etc.)

4. Prioritization in the chain. Prioritize themes and links based on risks of adverse impact on people, environment and organization. Define in which aspects the organization can intervene in short, medium and long term.

5. Depending on the information collected, identify the most demanding moments of design and innovation in the chain, which can be translated into products or services. If your project is product design, or involved with several designs, apply LCA, with the 4 introductory methods. (See day 2)

6. Attend or accompany the companies involved in the chain to define their own profile of impact and social/environmental responsibility through self-assessment, ISO 14001, standards, LCA of their products, footprints and other procedures.

7. In relation to local development: to detect mechanisms of distribution of benefits, subsumed links, negative dependencies. Explain which of the 4 power structures are exerted in the chain (Humphrey and Schmitz, 2000). Propose any changes or improvements in the distribution of benefits. State participation, NGOs. Identify which actor (company, person or institution) that would be ideal to coordinate the chain according to the target sought (can be internal or external to the chain). Planning a context for cooperation in GVC.

8. Describe in which aspects this chain contributes to a local development.

9. Conclusions. Describe the major problems encountered and potential improvements based on the objective to be met.

Clarification: Maintain the order of the workshop activities.
Day 2. Ecodesign and Design for sustainability

Theoretical foundation

"Ninety-five percent of Designers worldwide focus on their efforts to develop products and services exclusively for the top ten percent of the world’s customers. It takes nothing less than one revolution in design to reach the other 90%.” (Polak, 2007, p. 19)

The experience of recent years indicates that awareness and understanding of this situation are not enough if they are not accompanied by practical measures to guide how to make such changes. In order to achieve sustainable production and consumption models, new methodologies are needed both to project and to produce. When we seek to address the triple budget of environmental, economic and social issues in sustainability, it is a common reference to talk about Design for Sustainability or D4S. As the D4S focuses mainly on this triple articulation, its application in the project area acquires a specificity that goes beyond Ecodesign and the single materialization of objects. "It is worth asking, at this point, what is the difference between Design for Sustainability and Traditional Design? If we are going to look for a synthetic answer, we must say that the element that makes the difference is the Life Cycle Analysis. Only by comparing the environmental profiles of two different designs is it possible to define why and to what extent one can surpass another. The LCA is then a useful technique for both redesign and innovation." (Canale, 2013)

Content of day 2

The theoretical agenda held during the morning will include:

1. Basics of Ecodesign to Design for Sustainability - Life Cycle Thinking - Life Cycle Analysis (LCA) - LCA as a methodology - Uses and Advantages of a LCA - Tool Scope and Limitations

3. Contemporary environmental problems - Carbon Footprint, Environmental Footprint and Water Footprint - approach and differences. - Case development. An Introduction to Software Developed for LCA: EcoInvent Database (Switzerland) - Sima Pro, Umberto NXT

The objective of the workshop:

- Orient the designer so he/she can answer the question: how to distinguish when one design solution is more sustainable than another?

- Familiarize the designer with the use of different product analysis tools in their interaction with the environment and social environment at all stages of their Life Cycle and possible improvements resulting from the application of the eight D4S Strategies.

The workshop agenda held during the afternoon will include:
During the Seminar - Workshop, participants interested in Product Design should develop the steps to perform a simplified Life Cycle Analysis (LCA) for a product of their interest and outline the redesign proposal, contrasting both performances.

Module 2

Project 1- Evaluation of the initial condition of the product or service to be redesigned

Given a low complexity product whose details are well known, proceed to analyze their performance using the following tools:

1. Type of dominant in the product during its life cycle (Identify whether it is intensive in the use of raw materials, during manufacture, in transport, during use or in final disposal).

2. Use of the Approach Matrix to describe and highlight important issues and/or concerns related to the product to be designed or redesigned (Crul, 2006).

3. Profile analysis with the LCA tool Eco-it (provided by Pre-Consultants). The analysis should be prioritized and discard some design strategies of little or no application to that particular case.
4. With the results of steps 1, 2 and 3 as an orientation, approach the 8 strategies (rays) of the D4S Strategic Wheel one by one. Analyze the existing product profile with the D4S Strategic Wheel.

After undergoing the steps, specific topics will be listed that requires more information / research to find in specific bibliography of the course and / or consultation with teachers.

**Project 2 - Proposal for improvement**

Proposal for improvement. Based on the conclusions from Project 1, apply the strategies to improve the performance of the product/service. Try to improve the product based on all 8 strategies in the D4S Strategic Wheel.
Appendix B

Questionnaire to the course team

1. Do participants need any prerequisites before they can start the course? Do the students have prior knowledge about the contents?

2. What were the selection criteria of INTI centers to apply the knowledge of GVC and LCA?

3. What are the differences between student profiles? What are your academic and professional backgrounds?

4. According to the opinion of the students in what services offered to the industry apply the knowledge of GVC and LCA and which do not apply? What kind of industry is the most impacted by this tool?

5. What indicators do students use to evaluate their knowledge? Detail each of them in each stage: face-to-face and distance mode.

6. What are the reasons why students choose each of the GVC and LCA tools in each case? What factors determine the use of each of them and in what cases?

7. How are participants expected to work with the LCA and GVC tools after the course? Are they going to help SMEs to do full LCA and GVC of their products/services?

8. How would you integrate the knowledge of these new tools into your day-to-day management?
9. Will they use the LCA and GVC to develop INTI designs or to teach SMEs how they can develop their designs in a sustainable way?

10. What are the main obstacles in learning that are noticed, both in the face-to-face and in the distance mode?
Appendix C

Questionnaire to the participants

Information about this survey:
The participant in this survey may refuse to participate at any time. Any personal information will be anonymous. Responses will only be used for this research and will not be given to a third party.

Questions:

1. What were the reasons why you decided to take the course "Management of social, economic and environmental sustainability"?

2. Before beginning the course, did you have knowledge about Global Value Chains (GVC) and Life Cycle Analysis (LCA)?

3. On average, how many hours per week did you spend on this course besides the classes? (Read bibliography, review notes, practical work, etc.)

4. How do you think you will be able to apply GVC’s knowledge in your day-to-day management? Do you consider that there are difficulties in implementing GVC at work?

5. How do you think you will be able to apply LCA knowledge in your day-to-day management? Do you consider that there are difficulties in implementing LCA at work?

6. At the end of the course, do you believe that you have acquired all the conditions necessary for a continuous learning of the GVC and LCA methodologies? Why?
7. What elements would you incorporate and / or discard from the course to improve the learning?
Appendix D

Group interview

Introduction

- For how long have you been working at INTI?
- What kind of experience do you have? (Education, jobs etc)
- What is your job description? Which tasks are you working with?

Professional development

- What is professional development for you?
- What are your experiences of professional development within INTI? Do you have any good example? Have you developed professionally at INTI?
- How do your group/area at INTI work with professional development? How are you working to integrate content from courses?
- What are your experiences of receiving support from INTI to implement content from professional development courses and workshops?
- What are your experiences of the impact from professional development courses at INTI? Do you or your area implement the course content? How?
Course design

- What are your experiences from working with the projects after the two introduction days? How did it go?
- How did the introduction days at INTI’s main office prepare you for working with the projects by distance?
- What support did you receive when working with the projects by distance? What are your experiences of the support? Did you get the help needed if there were problems encountering sufficient data?

Participants knowledge of GVC and LCA after the course

- What were your experiences with GVC and LCA before the course?
- Could you explain to me what GVC and LCA is?
- How do you see yourself at an encounter with companies and the implementation of the GVC and LCA methodologies? Would you be able to apply your knowledge about GVC and LCA to help companies? How would you do it?
- What do you experience to be the difficulties when working with the GVC and LCA methodologies in your work? Do you have any example?
- What do you miss today to better learn, apply and integrate the GVC and LCA methodologies in your work?

Conclusions and suggestions

- Do you have any suggestions to improve the professional development in general at INTI?
- Do you have any suggestions to improve the course itself?
- Anything that I missed or that you would like to add to this conversation?