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Knowledge Transfer Flows Analysis Report

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1. INTRODUCTION

The ee-WiSE Project has been designed to achieve 3 main purposes: reach the European Energy Efficiency (EE) targets, promote the building retrofitting sector, and foster knowledge transfer within agents of the value chain. The project has been approved in the 2012 FP7 call, within the Theme: Methodologies for Knowledge Transfer within the Value Chain and particularly to SMEs and counts with an international consortium of 13 partners that include research institutes, companies (also SMEs), universities and public entities from 7 different countries in the Mediterranean area.

The main objective is to develop a knowledge transfer framework within the value chain in the EE Sector for building retrofitting in the Mediterranean area, and with special attention to SMEs. One of the most expected results of the Project is the development of a validated tool of knowledge management and transfer, which will include guidelines for business models, market up-take, inter-sectorial cooperation, and certification and tendering.

The information compiled, analyzed and produced in this document is focusing on what the retrofitting sector offers or what currently exists. This analysis is built on the definition of the value chain elaborated in the Methodological Framework of this Project. Knowledge transfer flows between agents are analyzed as well as the role each one of the agents play within it. This evaluation leads to discover breakpoints in the transfer flow and transmission problems by comparing the existing transfer flows and the ideal ones. With the final SWOT analysis, main results of crucial internal and external factors of the value chain appear in order to determine the real status of the value chain in the Mediterranean. This document supposes the identification of current underlying knowledge transfer processes and a useful tool for the next Work Packages that will aim to study the EE retrofitting sector and promote it across the Mediterranean and Knowledge Transfer (KT) measures.

1.1. Field of application - Scope

Month 4-7 of the Project were assigned for WP2 - *Study of the state of the art in the EE sector in building retrofitting*. The main objectives of WP2 are:

- Compilation and study of current situation in knowledge transfer processes and practices in the EE sector in building retrofitting with special attention to aspects concerning SMEs. This aim implies a research process throughout the WP.
- Identification of current underlying knowledge transfer processes, between agents of the value chain, detecting existing gaps.

Deliverable 2.2 brings together the outcomes of the second part of Work Package 2 – *Analysis of the Knowledge Transfer Flows Map; its real state and its breakpoints*, and also a complete SWOT study. Based on the methodology established on Work Package 1 – *Analysis Methodology Framework Development* - and using the results obtained in Task 2.1 – *Compilation and study of practices*-, this document identifies current knowledge transfer processes, under the responsibility of the task leaders - EU-CEO & AIDICO.

The compilation and study of practices (Task 2.1), developed by AIDICO, is the first step undertaken in WP2, but these results are not included in this deliverable.

Task 2.2, performed by AIDICO, identifies the knowledge transfer flows status between agents in the value chain. Based on the definition of the industry value chain made in WP1 and collection of relevant practices of the previous task, task 2.2 determines flows of knowledge transfer that currently exist among members of the value chain and its classification. All this study is reflected in a graphic way on a map that summarizes the current situation. This task is developed by AIDICO, applying its own experience and analytical capacities. Nevertheless, all partners have actively provided the input required for the correct realisation of the task and had revised the results that are produced.

Task 2.3, also performed by AIDICO, consist in the identification and analysis of the breakpoints in the transfer flow. Through the knowledge transfer flows map analysis, not only structure status is revealed, but also breakpoints where transfer processes show weakness or disconnection between key agents.

Adding all the descriptive information of the above tasks, a Strengths, Weakness, Opportunities and Threats (SWOT) analysis is proceed in Task 2.4. This well-known study leads to identify crucial internal and external factors necessary to achieve the main objective of the WP2 relating to the Knowledge Transfer within the value chain in the EE sector. EU-CEO performs this task applying its skills derived from its academic and research profile.

The consortium members' opinion has been considered in the whole analysis process. The leaders of this WP solicited the active participation of the rest of the partners. The partners' feedback has been taken into account throughout WP2.

Results of Deliverable 2.2 will guide further WP performance.

2. ABOUT KNOWLEDGE TRANSFER ¹

There have been many attempts to define and categorise knowledge. 2 major types of knowledge are often distinguished:

- **Explicit knowledge** – it is codified knowledge, expressed through language, e.g. documents, manuals, publications, patents. This type of knowledge is relatively easy to transfer, share and communicate.
- **Tacit knowledge** – knowledge derived from studies and experience. It is subconsciously understood and/ or applied but it is personal, context-specific and difficult to articulate. It is often called informal knowledge or even wisdom. Tacit knowledge has been described as “know-how” - as opposed to “know-what” (facts), “know-why” (science), or “know-who” (networking).

This distinction is sometimes claimed to be false. It is argued that all knowledge is tacit by its very nature – once outside a person’s mind any knowledge becomes information to another person, it is only in the mind that it can be called knowledge. Explicit knowledge can be considered a synonym of information.

Tacit knowledge is very difficult if not impossible to transfer, however it can be a key competitive asset of a company.

Knowledge artefacts are sometimes discussed as a separate form of knowledge. The artefacts refer to machinery, software, new materials, and new technologies.

There are many definitions of **Knowledge Transfer (KT)**:

- **Knowledge Transfer** describes how knowledge and ideas move between the knowledge source to the potential users of that knowledge. (Research Councils UK)
- **Knowledge Transfer** refers to systems and processes by which knowledge, including technology, know-how, expertise, and skills are transferred from one party to another, leading to innovative, profitable or economic and social improvements. (Institute of Knowledge Transfer).
- **Knowledge Transfer** involves the processes for capturing, collecting and sharing explicit and tacit knowledge, including skills and competence. It includes both commercial and non-commercial activities such as research collaborations, consultancy, licensing, spin-off creation, researcher mobility, publication, etc. While the emphasis is on scientific and technological knowledge other forms such as technology-enabled business processes are also concerned. (European Commission, 2007).

Knowledge Transfer can be of a **commercial or non-commercial** nature, it can take place inside an organization, between organizations and on an international level (Transnational Knowledge Transfer).

Non-commercial Knowledge Transfer consists of information that is not commercial – basic research or unpatented inventions. Non-commercial KT happens freely, without any legal documents or contracts. KT may also be unintended (spillovers).

The main forms of **Commercial Knowledge Transfer** are engineering; direct investment followed by construction, reconstruction, modernisation of enterprises or production process; scientific-industrial

cooperation; sale of patents and licences for any patented industrial property except of trademarks; sale of licences for any kind of know-how, manufacturing secrets, technological experience that is not protected by patent, etc. Commercial KT usually includes contracts to be signed.

KT can be **active or passive**. Active transfer includes a neutral intermediary organisation that helps/ is responsible for finding a better solution/ a better buyer. In passive transfer the developers of knowledge/ technology look for a partner on their own, assuming all the risks related to innovation and its commercialisation.

Despite of ever growing number of definitions, models and theories related to Knowledge Transfer, most would agree that KT is not an act but a complex, dynamic and multidirectional process. It has several pre-conditions:

- The organisation transferring knowledge must hold relevant state-of-the-art competence, be capable to produce it or to provide applied research services for the implementation and adaptation of knowledge developed elsewhere.
- There has to be a motivation to transfer knowledge. It could be benefits such as financial rewards, better reputation, or access to competence held by the other party of the transfer process.
- There has to be a knowledge transfer mechanism that is transparent to the potential users and capable of combining and integrating competences.

It can be argued that the term Knowledge Exchange or Knowledge Sharing better represents what is more usually called Knowledge Transfer. “Exchange” implies that this is a multi-way process where knowledge is shared and is moving in different directions – from academia to industry, from industry to academia, from one company to another, etc.

There are three main types of participants in the process of knowledge transfer:

- **Knowledge holders/ suppliers/ producers** are individuals and organisations that create knowledge. Historically research institutions were perceived as a source of new ideas, knowledge and technologies. However, other research, development and consulting centres established as independent companies or departments of large enterprises can also be actively involved in knowledge transfer. Often they are considered to have closer links with business. More and more SMEs and large companies employ open innovation approach, combining internal and external resources, aiming to maximise the value from their intellectual property.
- **Knowledge users** are any individuals or organisations that are on the “receiving” end of the knowledge chain. Adoption of new knowledge depends on absorptive capacity, which can be defined as an ability to recognize the value of new information, assimilate and apply it.
- The role of **Knowledge Brokers** (also known as **Knowledge Champions, Liaison Officers, Linkers, Synthesizers**, etc.) is considered as very significant in the Knowledge Transfer field. **Knowledge Brokers** may be individuals or organisations who take on the role of facilitating knowledge exchange between and among different stakeholders. They aim to develop relationships and networks with, among, and between producers and users of knowledge by providing linkages, knowledge sources, and in some cases knowledge itself, (e.g. technical know-how, market insights, research evidence) to organizations in their network.

3. KEY CONCEPTS AND METHODOLOGICAL ASPECTS

3.1. The Value Chain Actors

In the first phase of ee-WiSE, a full analysis of the EE Retrofitting Sector Value Chain is given to ensure a full and complete common understanding of the issues at hand. The value chain key players are classified in the below chart according to their roles in the retrofitting flow chart. From left to right, each actors plays their role in the EE retrofitting flow chart in one or some of the stages; analysis of current conditions, methodology, application and/or verification, respectively. All these players have also top to bottom or vice versa dependencies to each other while playing their role in the flow chart. However, in order not to make the value chain graph a complex one, these dependencies are not shown with arrows. Additionally, in this value chain graph the key players role is described as being a value chain main actor, or as a service provider or as being in the enabling environment is also shown in different colours as well as they are located in different areas of the value chain (Figure 1).

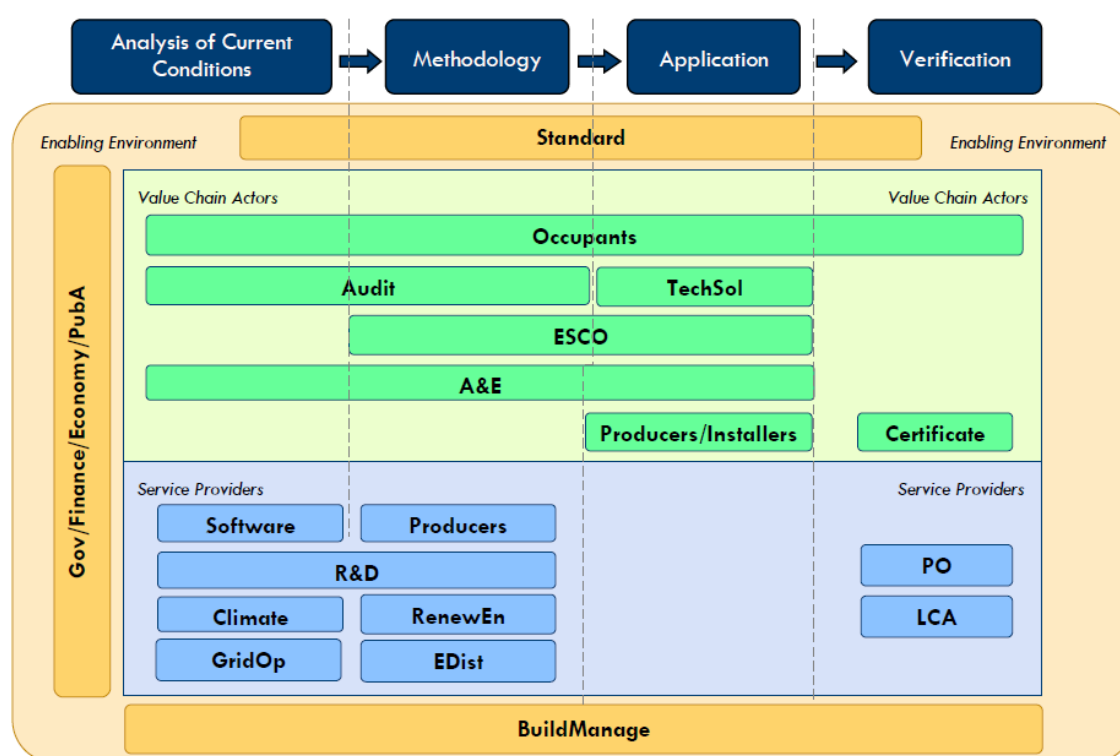


Figure 1: Energy Efficiency Retrofitting Sector's Value Chain

Abbreviations used in the Value Chain Graph

A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),

Audit: Energy auditing firms,

BuildManager: Real Estate agents and householders and building managers,

Certificate: Certification bodies,

Climate: Meteorologists,

Economy: Economists,

EDist: Energy distributors,

ESCO: Energy service companies,

Finance: Banks, Financial Agents, Promoters, Subsidizers,

Government: Government,

GridOp: Electric Power Transmission Grid Operators (GridOp)

Installers: Installers of building systems, building materials,

LCA: Life cycle assessment bodies,

Occupants: Homeowners and building users, occupants,

PO: Intellectual property bodies and patent offices.

Manufacturers: Manufacturers of building elements, building materials,

PubA: Public administration and authorities (ministries, municipalities, etc.),

R&D: R&D institutes, universities,

RenewEn: Renewable energy companies,

Software: Software developers,

Standard: Standardization bodies,

TechSol: Technical solutions developers companies.

In order to identify and clarify the knowledge flows between the agents involved in the energy efficient building retrofitting process, the actors involved in the value chain of energy efficient building retrofitting have been classified into 6 groups. The groups are defined as follows:

GROUP 1 - Public Bodies and Finance

This group is formed by the Enabling environment, i.e. infrastructure and policies, institutes and processes that shape the market environment.

- Public administration and authorities (ministries, municipalities, etc.) (PubA) classified as:
 - National authorities, create policies for EE Building Retrofitting at the national level, provide incentives, monitor national performance indicators, finance transfer of knowledge to the end user, etc.
 - Regional authorities facilitate local/communal EE Building Retrofitting initiatives; play a role in the development of green entrepreneurship on materials and services, etc.
 - Local authorities encourage EE Building Retrofitting in local communities, support transfer of knowledge to the end user, cooperate with academic and research institutions promoting EE Building Retrofitting.
- Standardization bodies (Standard): They are the organizations whose primary activities are developing, coordinating, publishing, revising, amending, reissuing, interpreting, or otherwise producing technical standards that are intended to address the needs of some relatively wide base of affected adopters. These bodies can be classified as the Enabling Environment, active at every stage, because analysis and methodology is based on written standards and directives, application methods and installed building materials and elements should be produced in accordance with the relevant standards, and finally, verification of EE retrofitting measures should be done accordingly.
- Banks, Financial Agents, Promoters, Subsidizers (Finance)

GROUP 2 - Knowledge and Products Providers

This group is formed by Knowledge and Products Providers:

- Technical solutions developers companies, Software developers (TechSol): They develop and provide innovative services, install retrofitting measures necessary for buildings primarily assessed by Audit. Software developers are also included in this group (Software). They design software for estimating the energy consumption of buildings, as well as the software for EE simulation and monitoring purposes.
- R&D institutes, universities, Climate (R&D): With the proliferation of government and utility-sponsored efficiency programs, many consultants, researchers and building scientists have emerged to support the policy directions and implementation of these programs. Many of these firms and organizations provide program development, program design, program implementation, evaluation, technical services, and training to clients. Their technical experience and expertise usually span diagnostic work, energy assessments, health and safety issues, and moisture problems.

- Manufacturers of building elements, building materials (Manufacturer): Their work is to produce building elements/materials and the fixtures for these elements which are mainly used for EE retrofitting.
- Installers: Their work is to install building systems and building materials which are mainly used for EE retrofitting.

GROUP 3 - Energy Providers

This group is formed by Energy Providers, from renewable energy companies and electric power transmission grid operators to energy distributors.

- Energy distributors (EDist): They are responsible for transporting energy to final customers or to distribution stations that sell energy to final customers.
- Renewable energy companies (RenewEn). They produce energy from renewable sources, solar, wind, hydraulic, geothermal, biomass, etc.
- Electric Power Transmission Grid Operators (GridOp). They build, maintain and provide the necessary network. It is possible to measure and evaluate the regional, national or International energy consumption Trend.

GROUP 4 - Energy and Retrofitting Services Providers

This group is formed by Energy and Retrofitting Services Providers: Architecture and engineering companies, energy auditing firms and energy service companies.

- Architecture and Engineering Companies (A&E): Generally address building energy issues within new construction, renovation and retrofitting projects. Their mission is to ensure that the buildings are constructed and/or renovated meeting the standards and building plan specifications. While most firms know the residential standard requirements, few know advanced diagnostics, air sealing techniques, dense pack wall insulation techniques, state-of-the-art energy efficiency retrofits and replacements, occupant health and safety issues, and energy education design and delivery².
- Energy auditing firms (Audit): Depending on the definition given in EPBD 2006, the main purposes of Energy Audit are obtaining adequate knowledge of the existing energy consumption profile of a building or group of buildings an industrial or commercial operation or installation or a private or public service and also identifying and quantifying cost effective energy saving opportunities and reporting the findings. Energy audit can be defined as a systematic procedure that serves as a control mechanism of the cost effective energy saving processes. Thus, energy auditing firms are responsible for inspecting the housing units and recommending cost-effective, energy-efficiency retrofitting measures for them³.
- Energy Service Companies (ESCOs): Depending on the definition given in EPBD 2012, the main purposes of ESCOs are delivering energy services and energy efficient improvement measures. ESCOs offer their customers services planning, implementation and, in some cases, financing of measures to improve energy efficiency in their facilities. The ESCO assumes some degree of

financial risk, by conditioning the payment of services rendered to the actual obtaining of energy savings.

GROUP 5 - Quality assurance

This group is formed by actors in charge of the quality assurance: Certification bodies, intellectual property bodies and patent offices and life cycle assessment companies.

- Certification bodies (Certificate): They provide energy performance certification which is a mean of rating individual buildings on how efficient (or inefficient) they are in accordance with the certification definitions given in the relevant standards⁴. Regulations and the climate are different in every country so that certification level is also different. From the energy efficiency viewpoint, the certification bodies would have the function of giving a label according to the procedure of calculation to obtain the level of energy efficiency of the building according to the methodology included in the Directive 2002/91/CE on the energy performance of building.
- Intellectual Property bodies and Patent offices (PO): They are responsible for examining and issuing or rejecting patents, and maintaining registers of intellectual property including patents, designs and (in some cases) trademarks.
- Life cycle assessment companies (LCA): They evaluate the total energy consumed in all steps from acquisition of the raw material to end product step and assess the sustainability of the buildings. This analysis also includes the direct and indirect embodied energy inputs⁵.

GROUP 6 – Demand

- Homeowners and building users, occupants (Occupants): Occupants are the users of the building, and building owners literally are the financial owners of the building. They are the ones who provide support from the government or from financial agents if necessary. Additionally, the payback period is an important issue for building owners.
- Real Estate agents, householders and building managers (BuildManage)

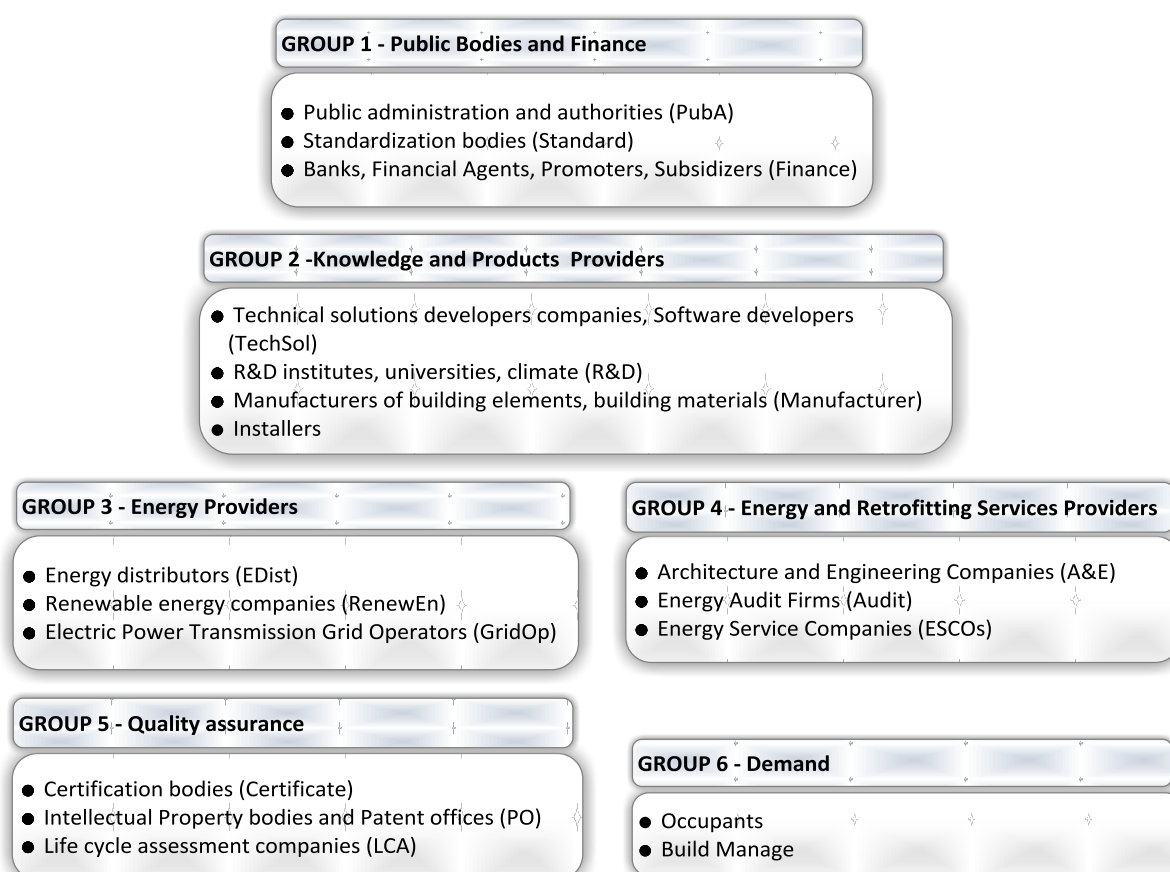


Figure 2: Energy Efficiency Retrofitting Sector's Groups

3.2. Methodology

The methodology used in the compilation, analysis and production performed in this WP is based on the baseline and procedures of the Project described in WP1.

The Project is looking for solutions on the Mediterranean Area and to improve communication among agents of these countries. To achieve the objective of this study, the research is based on a qualitative approach due to the scarcity of relevant literature assessing the European knowledge transfer landscape and the lack of available quantitative data.

The research combines multiple data collection methods:

- Data collected through stakeholders interviews;
- Data collected from partners of the Project;
- Data collected on the basis of existing data sets.

The main tools used by the Project Team are the following:

- **Expert panel.** The Project Team complemented its own expertise by assembling a team of professionals, experienced scientists, practitioners, and producers with experience in the EE Retrofitting Sector.
- **Targeted interviews.** The interview process was an iterative process with structured interviews. It started with a “Knowledge transfer flow crosstab”, revised and adapted according to periodic analysis during the data collection process. Some broad questions guided the Project Team and experts throughout the interviews, ensuring the collection of sufficiently comparable data. The crosstab that served as a guide to the interview process is in Figure 3.
- **Desk research.** As interviews essentially provide qualitative information, a number of studies focused on quantitative data were reviewed to complement the analysis. It should be noted that knowledge transfer remains an incipient, imperfect market and there are few standard definitions, and little data is collected in a systematic way⁶. Despite the European survey supported by the European Commission on technology transfer⁷ there is insufficient fact-based research into the knowledge and technology transfer situation in Europe.
- **Brainstorming meetings.** In order to review analyses and discuss results, a number of brainstorming meetings were organised.

4. MAP OF KNOWLEDGE TRANSFER FLOWS

4.1. Identification of the knowledge transfer flows

In this part of the study, the results of the data analysis are presented. In order to reveal the knowledge transfer flows between agents, it is essential to identify the individual knowledge transfer flows between them and the level of knowledge transfer. Based on the definition of the industry value chain and in the previous classification (Figure 2), the next flows have been identified:

- Flows of knowledge transfer among members of the value chain:
 - Optimum Knowledge Transfer Flow: A knowledge transfer flow identified that works perfectly. Objective of ee-WiSE project.
 - Identified Knowledge Transfer Flow: An existing knowledge transfer flow currently established, which is coherent but could be much better.
 - Weak Knowledge Transfer: A knowledge transfer flow that needs to be improved. Priority to work with.
 - Breakpoint: A necessary but inexistent knowledge transfer flow. Priority to work with.
 - Inexistent Knowledge Transfer Flow: Inexistent knowledge transfer flow. This flow will remain under observation in case the evolution of the project detects a KT flow is needed.

A fundamental goal drove the collection of the data and the subsequent data analysis: the flows of knowledge transfer among members of the value chain were identified and classified what allowed developing a final knowledge transfer flow crosstab (Figure 3), which has been the basic tool to develop the Knowledge Transfer Flow Map.

The analysis also identifies:

- Agents involved in each flow
- Type of flows:
 - Formal: Flows formally established.
 - Informal: Informal flows but also transmitters of knowledge among agents.
- Relevance of the flow: critical and non-critical.
 - Critical: those which have a decisive influence on the proper flow of knowledge between agents and contribute to value creation.
 - Non-critical: while contributing to a more correct transmission of knowledge but does not require special attention.

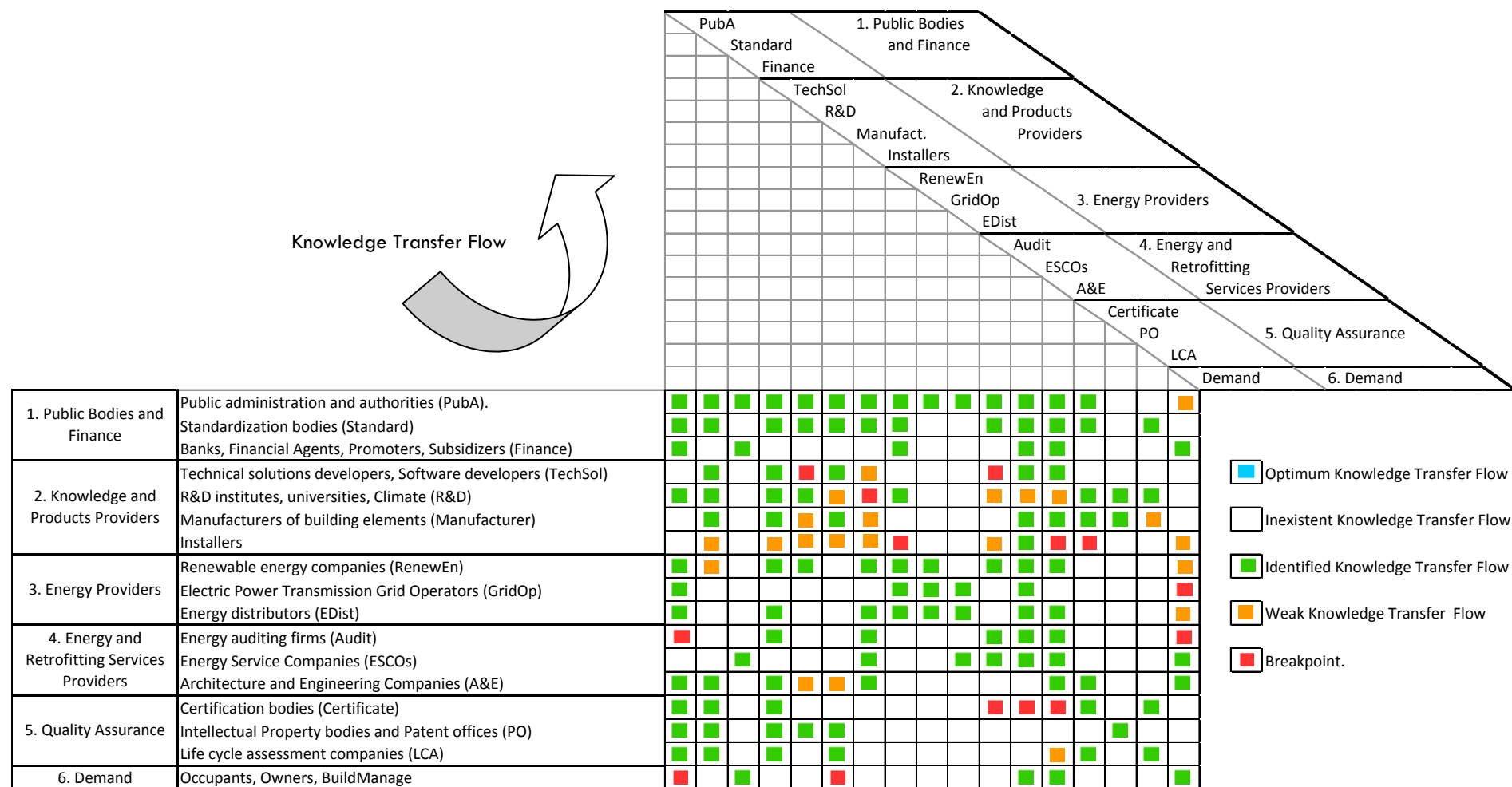


Figure 3: Knowledge transfer flow crosstab

4.2. The Knowledge Transfer Flows Map

As a result of the data analysis, the next Knowledge Transfer Flows Map has been defined. (Figure 4)

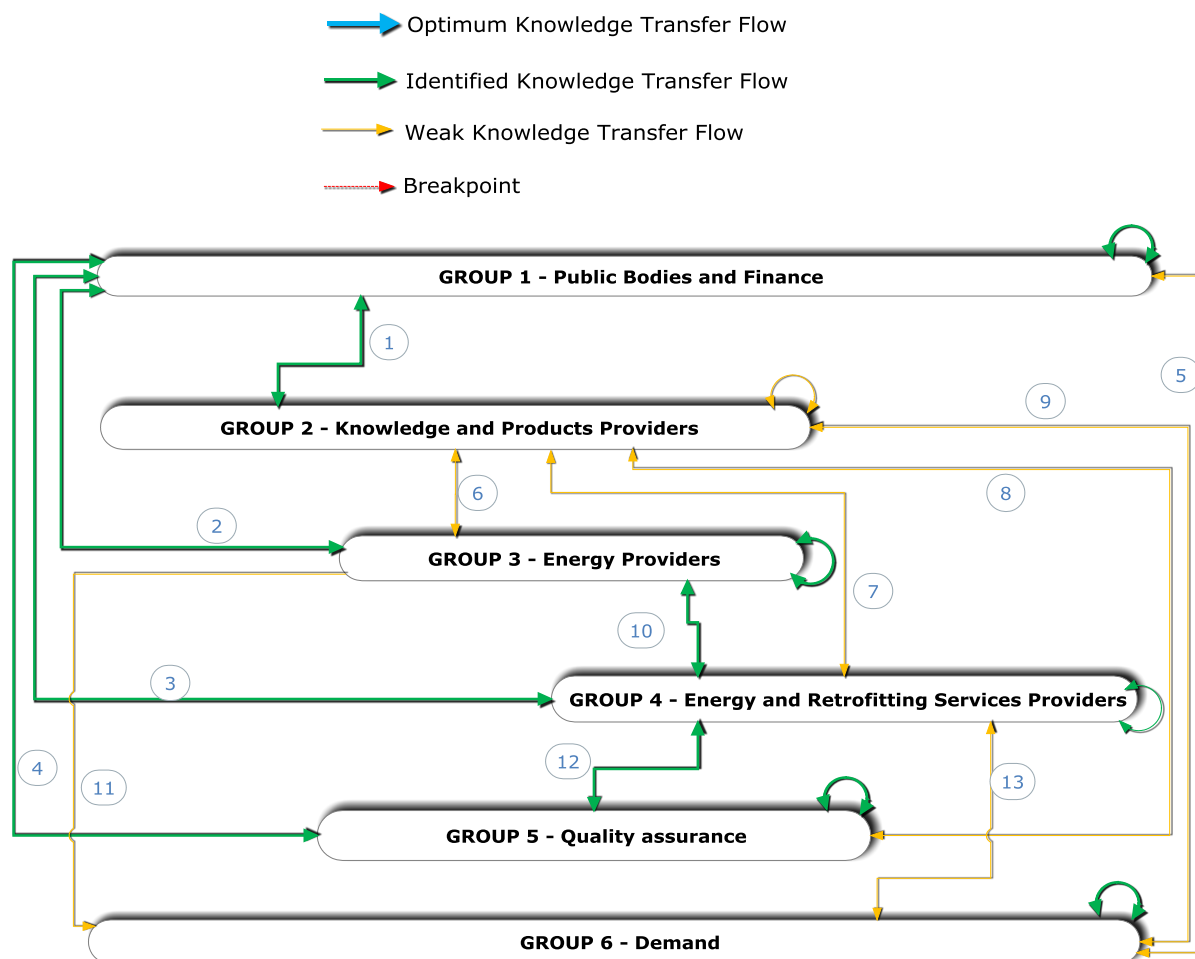


Figure 4: Knowledge Transfer Flows Map

Although there are some knowledge transfer flows currently working, there are not any optimum knowledge transfer flows. The knowledge transfer of retrofitting technologies is not flowing effectively amongst agents in the EE value chain. Thirteen main flows have been identified. Each main flow is studied in a detailed way in the following subsections and its flows and breakpoints are analyzed.

- The main flow number 1 is the one established between the Public Bodies and Finance Group and the Knowledge and Products Providers Group. Most of the knowledge transfer flows between them work properly, although a weak knowledge transfer flow between a member of the first group and a member of the second one is detected.
- The main flow number 2 is the one established between the Public Bodies and Finance Group and the Energy Providers Group. Most of the knowledge transfer flows between them work properly, although a weak knowledge transfer flow between the groups is detected.

- The main flow number 3 is the one established between the Public Bodies and Finance Group and the Energy and Retrofitting Services Providers Group. Most of the knowledge transfer flows between them work properly, although a breakpoint between the groups is detected.
- The main flow number 4 is the one established between the Public Bodies and Finance Group and the Quality Assurance Group. All of the knowledge transfer flows between them work properly.
- The main flow number 5 is the one established between the Public Bodies and Finance Group and the Demand Group. Weak or inexistent knowledge transfer flows between the groups are identified.
- The main flow number 6 is the one established between the Knowledge and Product Providers Group and the Energy Providers Group. Some knowledge transfer flows between the groups work properly, although a breakpoint between them is detected.
- The main flow number 7 is the one established between the groups of the Knowledge and Product Providers and the Energy and Retrofitting Services Providers. Weak or inexistent knowledge transfer flows between them are identified.
- The main flow number 8 is the one established between the groups of Knowledge and Product Providers and Energy and Quality Assurance. Weak or inexistent knowledge transfer flows between the groups are identified.
- The main flow number 9 is the one established between the Knowledge and Product Providers Group and Demand Group. Weak or inexistent knowledge transfer flows between the groups are identified.
- The main flow number 10 is the one established between the groups of the Energy Providers and Energy and Retrofitting Services Providers. All of the Knowledge transfer flows between them work properly.
- The main flow number 11 is the one established between the Energy Providers Group and Demand Group. Weak or inexistent knowledge transfer flows between the groups are identified.
- The main flow number 12 is the one established between the Energy and Retrofitting Services Providers Group and the Quality Assurance Group. Weak or inexistent knowledge transfer flows between the groups are identified.
- The main flow number 13 is the one established between the Energy and Retrofitting Services Providers Group and the Demand Group. Most of the Knowledge transfer flows between them work properly, although a breakpoint between the groups is detected.

Each main flow is studied in a detailed way in the following subsections:

4.2.1. Flow_1. Public Bodies and Finance – Knowledge and Products Providers

The main flow number 1 is the one established between the Public Bodies and Finance Group and the Knowledge and Products Providers Group. There are seven agents involved in this main flow:

- Finance: Banks, Financial Agents, Promoters, Subsidizers,
- PubA: Public administration and authorities (ministries, municipalities, etc.),
- Standard: Standardization bodies,
- TechSol: Technical solutions developers companies, Software developers,
- Manufacturers: Manufacturers of building elements, building materials,
- Installers: Installers of building systems, building materials,
- R&D: R&D institutes, universities, Climate.

The most remarkable problems transmissions appear between the members of the Knowledge and Products Providers Group.

- “Installers” have weak knowledge transfer flows with all the members of the Knowledge and Products Providers Group and also with “Standard”.
- “Manufacturers” have weak knowledge transfer flows with “Installers” and “R&D”.
- “TechSol” have weak knowledge transfer flows with “Installers” and a Breakpoint with “R&D”.
- “R&D” have weak knowledge transfer flows with “Manufacturers” and a Breakpoint with “Installers”.

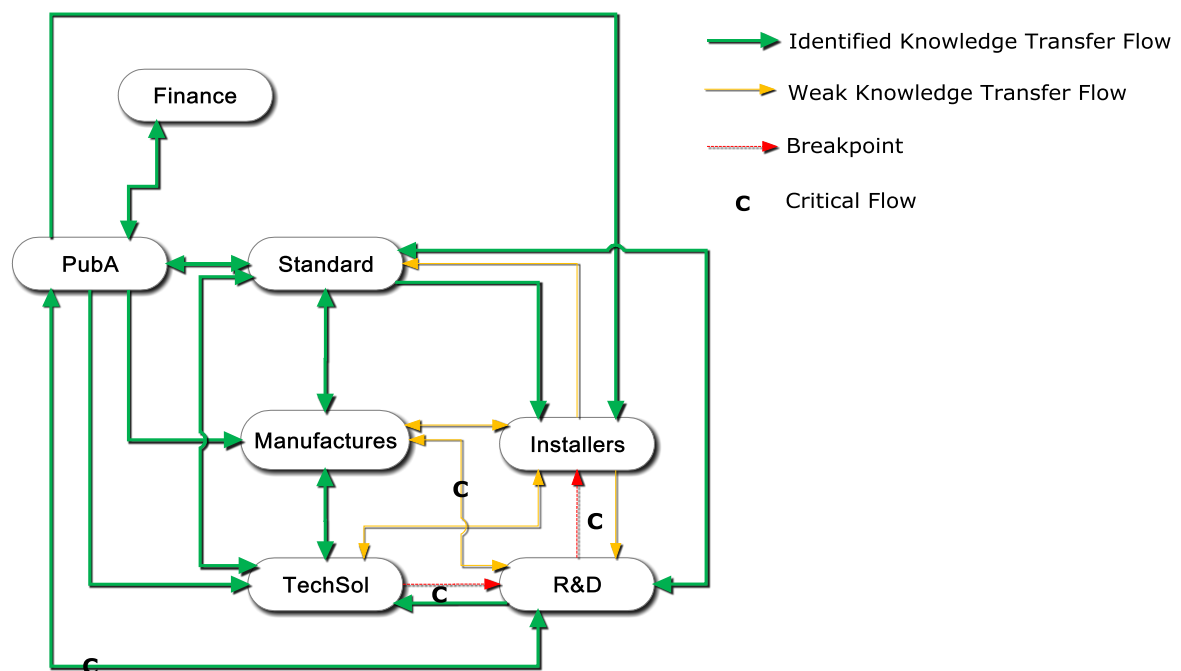


Figure 5: Flow_1. Public Bodies and Finance – Knowledge and Products Providers

There are four critical flows which have a decisive influence on the proper flow of knowledge between agents and contribute to value creation:

- The flow from “PubA” to “R&D” and vice versa.
- The flow from “Manufacturers” to “R&D” and vice versa.
- The flow from “TechSol” to “R&D” and vice versa.
- The flow from “Installers” to “R&D” and vice versa.

Only one of the critical flows detected is working properly (PubA \Leftrightarrow R&D). The rest of them have to be improved (Manufacturers \Leftrightarrow R&D, TechSol \Leftrightarrow R&D, Installers \Leftrightarrow R&D).

Most of the currently working flows are formally established, but some informal flows are also detected from and “Finance” to “PubA”, from “TechSol” to “Manufacturers”, from “R&D” to “PubA” and “TechSol” and from “Manufacturers” to “Standard” and “TechSol”. Weak knowledge transfer flows are mostly informal flows.

4.2.2. Flow_2. Public Bodies and Finance – Energy Providers

The main flow number 2 is the one established between the group of the Public Bodies and Finance and the group of the Energy Providers. There are six agents involved in this main flow:

- Finance: Banks, Financial Agents, Promoters, Subsidizers,
- PubA: Public administration and authorities (ministries, municipalities, etc.),
- Standard: Standardization bodies,
- RenewEn: Renewable energy companies,
- GridOp: Electric Power Transmission Grid Operators,
- EDist: Energy distributors.

The knowledge transfer flows between the agents are working properly and only a weak knowledge transfer flow is identified from “RenewEn” to “Standard”. There are no critical flows

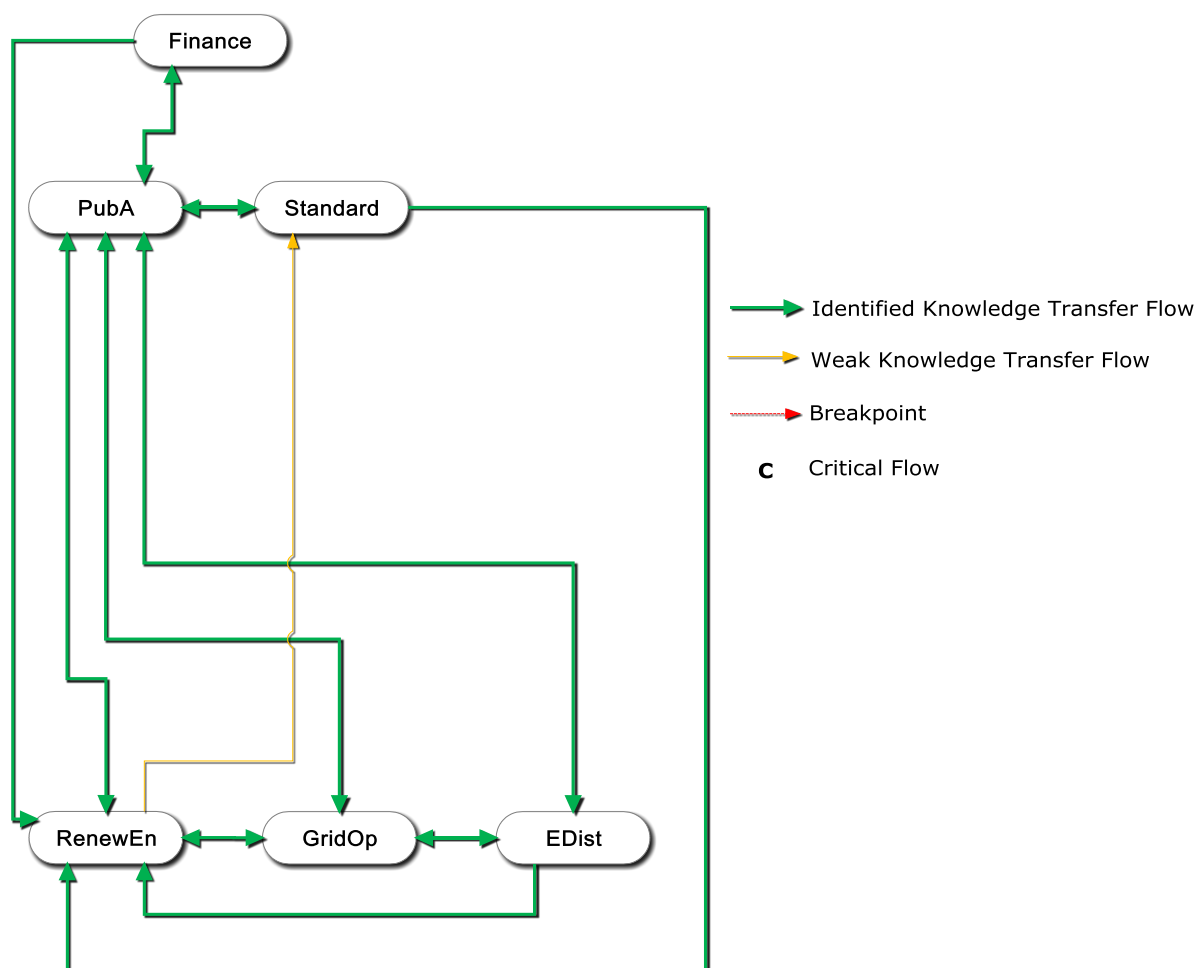


Figure 6: Flow_2. Public Bodies and Finance –Energy Providers

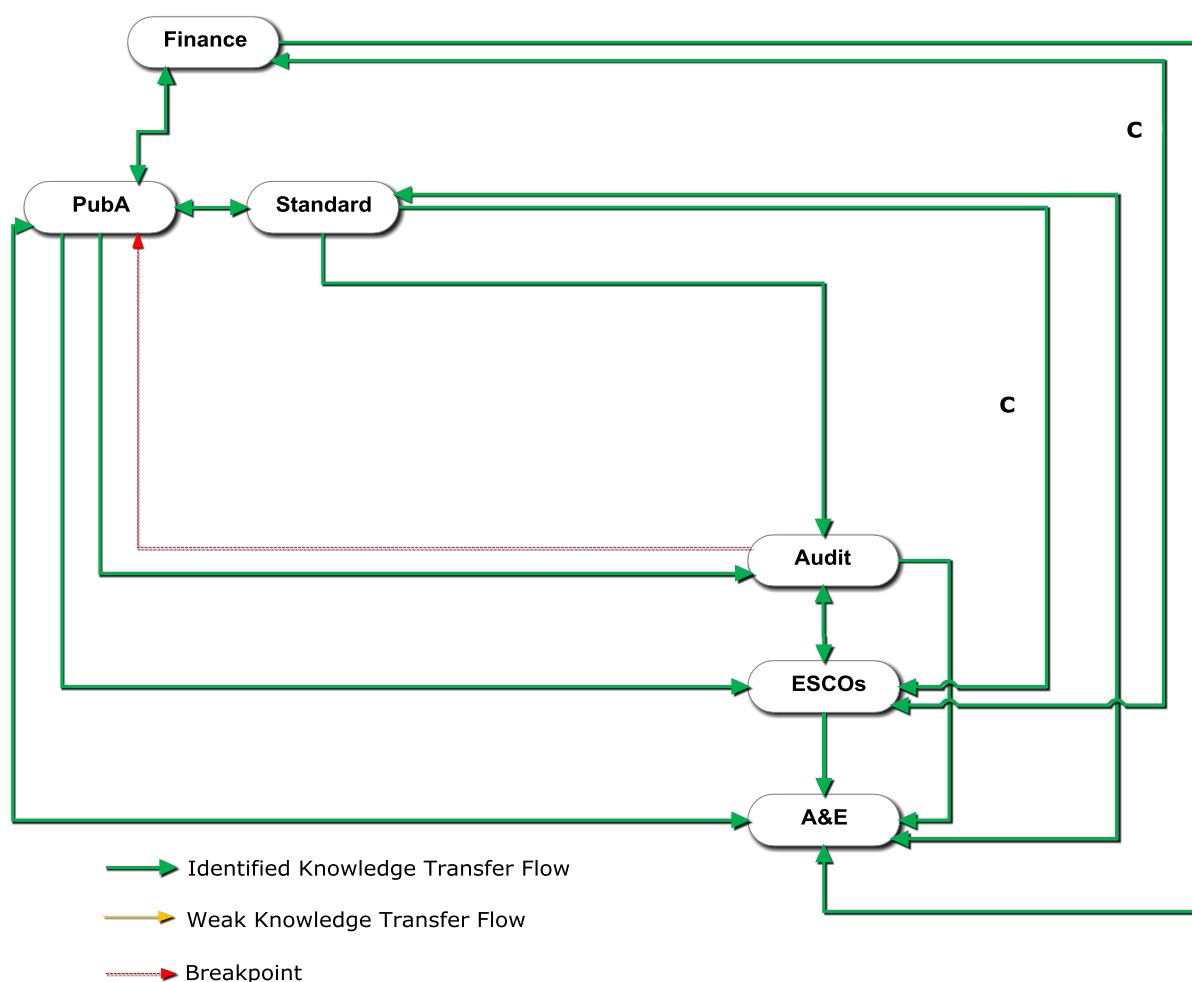
Most of the currently working flows are formally established. Once again, some informal transference has been detected in the weak knowledge transfer flows, in particular from “RenewEn” to “Standard”

4.2.3. Flow_3. Public Bodies and Finance – Energy and Retrofitting Services Providers

The main flow number 3 is the one established between the Public Bodies and Finance Group and the Energy and Retrofitting Services Providers Group. There are six agents involved in this main flow:

- Finance: Banks, Financial Agents, Promoters, Subsidizers,
- PubA: Public administration and authorities (ministries, municipalities, etc.),
- Standard: Standardization bodies,
- A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),
- Audit: Energy auditing firms,
- ESCO: Energy service companies.

The knowledge transfer flows between the agents are working properly and only a breakpoint is identified from “Audit” to “PubA”. The critical flows detected are working properly. (Standard \Rightarrow ESCOs, Finance \Leftrightarrow ESCOs). Most of the flows are formally established, although some informal transference has been detected.



C Critical Flow

Figure 7: Flow_3. Public Bodies and Finance –Energy and Retrofitting Services Providers

4.2.4. Flow_4. Public Bodies and Finance – Quality assurance

The main flow number 4 is the one established between the Public Bodies and Finance Group and the Quality Assurance Group. There are six agents involved in this main flow:

- Finance: Banks, Financial Agents, Promoters, Subsidizers,
- PubA: Public administration and authorities (ministries, municipalities, etc.),
- Standard: Standardization bodies,
- Certificate: Certification bodies,
- LCA: Life cycle assessment bodies,
- PO: Intellectual property bodies and patent offices.

The knowledge transfer flows between the agents are working properly and there are no critical flows. Most of the flows are formally established.

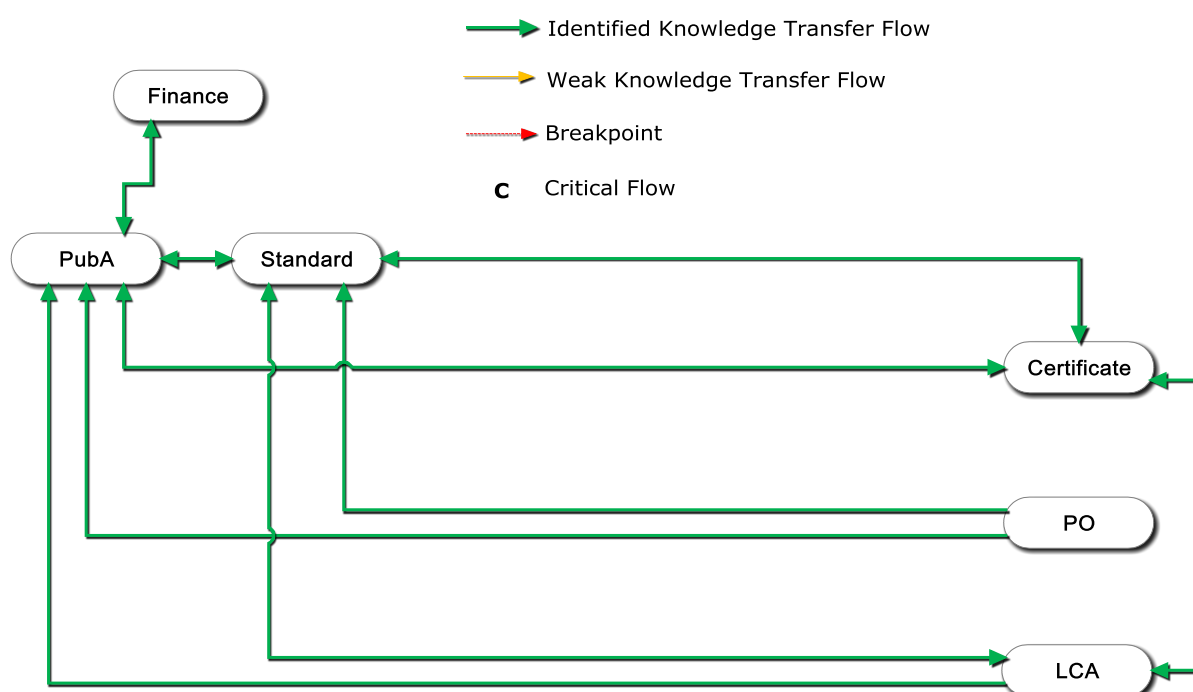


Figure 8: Flow_4. Public Bodies and Finance –Quality assurance

4.2.5. Flow_5. Public Bodies and Finance – Demand

The main flow number 5 is the one established between the Public Bodies and Finance Group and the Demand Group. There are four agents involved in this main flow:

- Finance: Banks, Financial Agents, Promoters, Subsidizers,
- PubA: Public administration and authorities (ministries, municipalities, etc.),
- Standard: Standardization bodies,
- Demand: Homeowners and building users, occupants (Occupants). Real Estate agents and householders and building managers (BuildManage).

The most remarkable problems transmissions appear between the public administrations and the demand. In addition, it is a critical flow. There is a weak knowledge transfer flow from “PubA” to “Demand”, and a breakpoint from “Demand” to “PubA”.

The critical flow between “Finance” and “Demand” is working properly. Most of the flows are formally established.

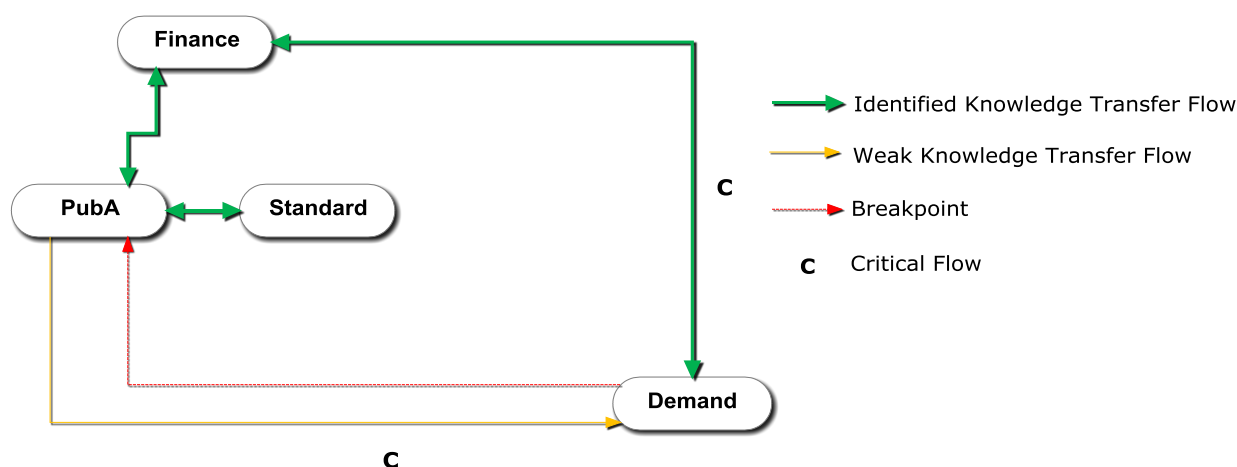


Figure 9: Flow_5. Public Bodies and Finance –Demand

4.2.6. Flow_6. Knowledge and Products Providers – Energy Providers

The main flow number 6 is the one established between the Knowledge and Product Providers Group and the Energy Providers Group. There are seven agents involved in this main flow:

- TechSol: Technical solutions developers companies, Software developers,
- Manufacturers: Manufacturers of building elements, building materials,
- Installers: Installers of building systems, building materials,
- R&D: R&D institutes, universities, Climate,
- RenewEn: Renewable energy companies,
- GridOp: Electric Power Transmission Grid Operators,
- EDist: Energy distributors.

As in a previous section has been explained, the most remarkable problems transmissions appear between the members of the Knowledge and Products Providers Group.

- “Installers” have weak knowledge transfer flows with all the members of the Knowledge and Products Providers Group and a there is a breakpoint with “RenewEn”.
- “Manufacturers” have weak knowledge transfer flows with “Installers” and “R&D”.
- “TechSol” have weak knowledge transfer flows with “Installers” and a breakpoint with “R&D”
- “R&D” have weak knowledge transfer flows with “Manufacturers” and a breakpoint with “Installers”.

The critical flows detected have to improve (Manufacturers \leftrightarrow R&D, TechSol \leftrightarrow R&D, Installers \leftrightarrow R&D).

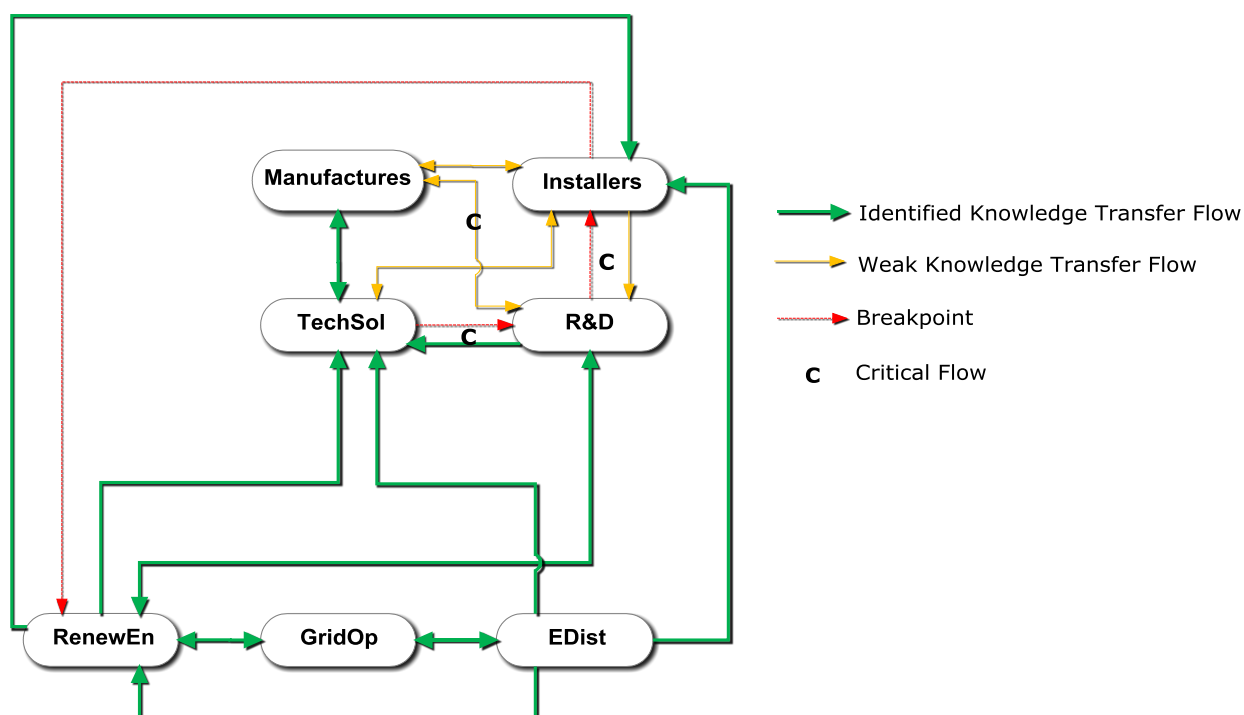


Figure 10: Flow_6. Knowledge and Products Providers – Energy Providers

Informal transference appears frequently in weak knowledge transfer flows between the members of the Knowledge and Product Providers Group. Additionally, informal transfer flows are detected in currently working flows. The most remarkable appear from “R&D” to “RenewEn” and vice versa, from “RenewEn” to “Installers” and from “EDist” to “TechSol”.

4.2.7. Flow_7. Knowledge and Products Providers – Energy and Retrofitting Services Providers

The main flow number 7 is the one established between the Knowledge and Product Providers Group and the Energy and Retrofitting Services Providers Group. There are seven agents involved in this main flow:

- TechSol: Technical solutions developers companies, Software developers,
- Manufacturers: Manufacturers of building elements, building materials,
- Installers: Installers of building systems, building materials,
- R&D: R&D institutes, universities, Climate,
- A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),
- Audit: Energy auditing firms,
- ESCO: Energy service companies.

As in the previous section has been explained, the most remarkable problems transmissions appear between the members of the Knowledge and Products Providers Group. In addition, knowledge transfer weakness also appears in the relation with the Energy and Retrofitting Services Providers Group.

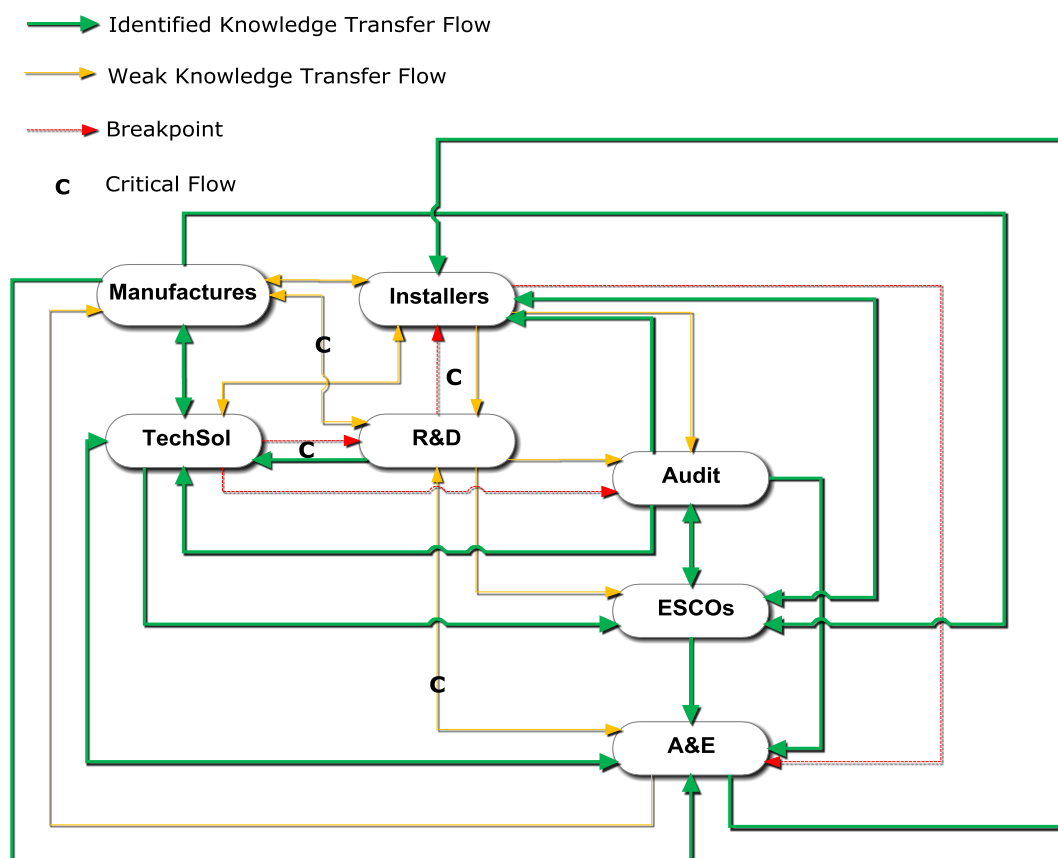


Figure 11: Flow_7. Knowledge and Products Providers – Energy and Retrofitting Services Providers

- “Installers” have weak knowledge transfer flows with “Audit” and a breakpoint with “A&E”.

- “TechSol” have a breakpoint with “Audit”.
- “R&D” have weak knowledge transfer flows with “ESCOs” and “A&E”.
- “A&E” have weak knowledge transfer flows with “R&D” and a breakpoint with “Manufactures”.

The critical flow (R&D \Rightarrow A&E) has to improve.

In addition to the above-mentioned informal flows between the Knowledge and Product Providers Group, some informal transference has been detected in the weak knowledge transfer flows. Informal transference also appears from “A&E” to “TechSol” and from “ESCOs” to “A&E”.

4.2.8. Flow_8. Knowledge and Products Providers – Quality assurance

The main flow number 8 is the one established between the groups of the Knowledge and Product Providers and the Energy and Quality assurance. There are seven agents involved in this main flow:

- TechSol: Technical solutions developers companies, Software developers,
- Manufacturers: Manufacturers of building elements, building materials,
- Installers: Installers of building systems, building materials,
- R&D: R&D institutes, universities, Climate,
- Certificate: Certification bodies,
- LCA: Life cycle assessment bodies,
- PO: Intellectual property bodies and patent offices.

As in the previous section has been explained, the most remarkable problems transmissions appear between the members of the Knowledge and Products Providers Group. In addition, there is a weak knowledge transfer flow from “Manufacturers” to “LCA” and there is a breakpoint from “Installers” to “Certificate”. In addition to the above-mentioned informal flows between the Knowledge and Product Providers Group, some informal transference has been detected from “Manufactures” to “Certificate” and “LCA”.

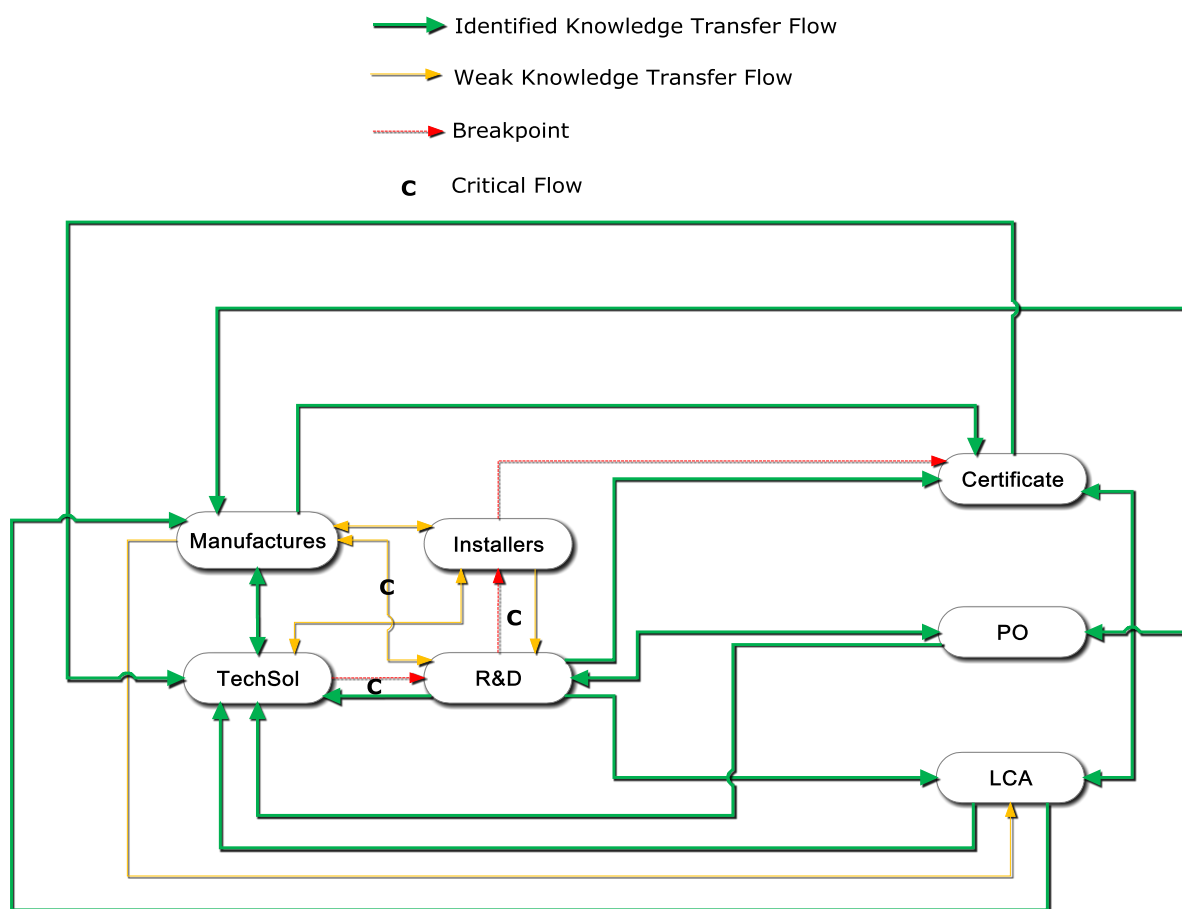


Figure 12: Flow_8. Knowledge and Products Providers –Quality assurance

4.2.9. Flow_9. Knowledge and Products Providers – Demand

The main flow number 9 is the one established between the Knowledge and Product Providers Group and the Demand Group. There are five agents involved in this main flow:

- TechSol: Technical solutions developers companies, Software developers,
- Manufacturers: Manufacturers of building elements, building materials,
- Installers: Installers of building systems, building materials,
- R&D: R&D institutes, universities, Climate,
- Demand: Homeowners and building users, occupants (Occupants). Real Estate agents and householders and building managers (BuildManage).

There are important knowledge transfer problems between these agents.

- “Installers” have weak knowledge transfer flows with all the members of the Knowledge and Products Providers Group and also with “Demand”.
- “Manufacturers” have weak knowledge transfer flows with “Installers” and “R&D”.
- “TechSol” have weak knowledge transfer flows with “Installers” and a breakpoint with “R&D”
- “R&D” have weak knowledge transfer flows with “Manufacturers” and a breakpoint with “Installers”.
- There is a breakpoint from “Demand” to “Manufacturers”.

Moreover, these flows deserve special attention because it presents four critical flows to be improved. (Manufacturers \Leftrightarrow R&D, TechSol \Leftrightarrow R&D, Installers \Leftrightarrow R&D, Installers \Rightarrow Demand).

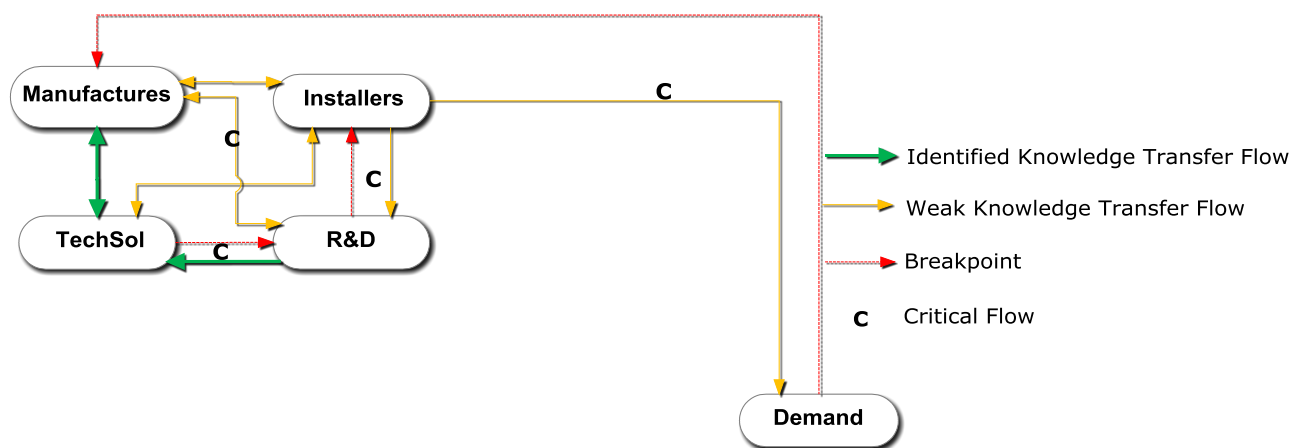


Figure 13: Flow_9. Knowledge and Products Providers –Demand

In addition to the above-mentioned informal flows between the Knowledge and Product Providers Group, knowledge transfer flows from “Demand” are usually informal.

4.2.10.Flow_10. Energy Providers – Energy and Retrofitting Services Providers

The main flow number 10 is the one established between the Energy Providers Group and the Energy and Retrofitting Services Providers Group. There are six agents involved in this main flow:

- RenewEn: Renewable energy companies,
- GridOp: Electric Power Transmission Grid Operators,
- EDist: Energy distributors,
- A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),
- Audit: Energy auditing firms,
- ESCO: Energy service companies.

The knowledge transfer flows between the agents are working properly and there are no critical flows. Most of the flows are formally established.

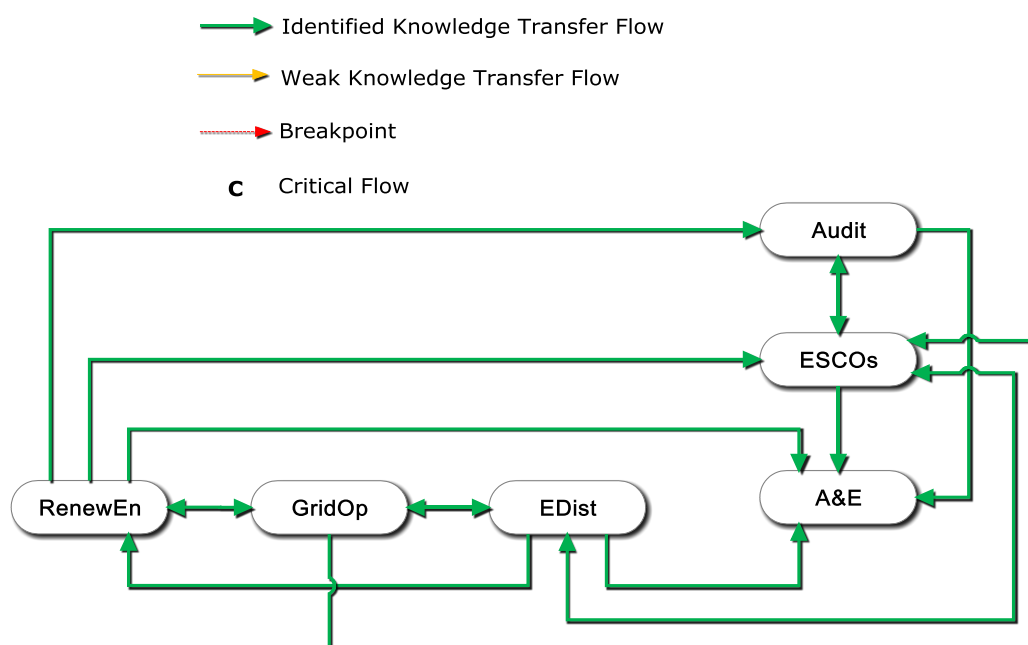


Figure 14: Flow_10. Energy Providers – Energy and Retrofitting Services Providers

4.2.11. Flow_11. Energy Providers – Demand

The main flow number 11 is the one established between the groups of the Energy Providers and Demand. There are four agents involved in this main flow:

- RenewEn: Renewable energy companies,
- GridOp: Electric Power Transmission Grid Operators,
- EDist: Energy distributors,
- Demand: Homeowners and building users, occupants (Occupants). Real Estate agents and householders and building managers (BuildManage).

There are important knowledge transfer problems with the Energy Providers and the “Demand”

- “RenewEn” have weak knowledge transfer flows with “Demand”.
- “GridOp” have a breakpoint with “Demand”.
- “EDist” have weak knowledge transfer flows with “Demand”.

Moreover, these flows deserve special attention because all of them are critical flows (RenewEn \Rightarrow Demand, GridOp \Rightarrow Demand, EDist \Rightarrow Demand).

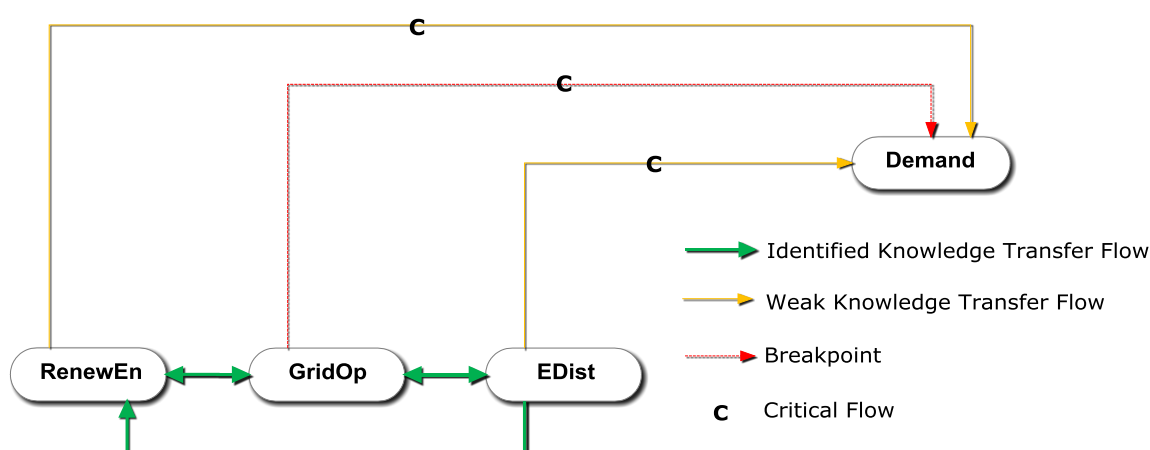


Figure 15: Flow_11. Energy Providers – Demand

Most of the flows are formally established, but some informal flows are also identified from “RenewEn” to “Demand”.

4.2.12.Flow_12. Energy and Retrofitting Services Providers – Quality assurance

The main flow number 12 is the one established between the groups of the Energy and Retrofitting Services Providers and Quality assurance. There are six agents involved in this main flow:

- A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),
- Audit: Energy auditing firms,
- ESCO: Energy service companies,
- Certificate: Certification bodies,
- LCA: Life cycle assessment bodies,
- PO: Intellectual property bodies and patent offices.

The main knowledge transfer problems have been detected between the “Certificate” and agents of the Energy and Retrofitting Services Providers Group.

- “Certificate” have a breakpoint with “Audit”, “ESCOs” and “A&E”.
- “LCA” have weak knowledge transfer flows with “A&E”.

There are no critical flows.

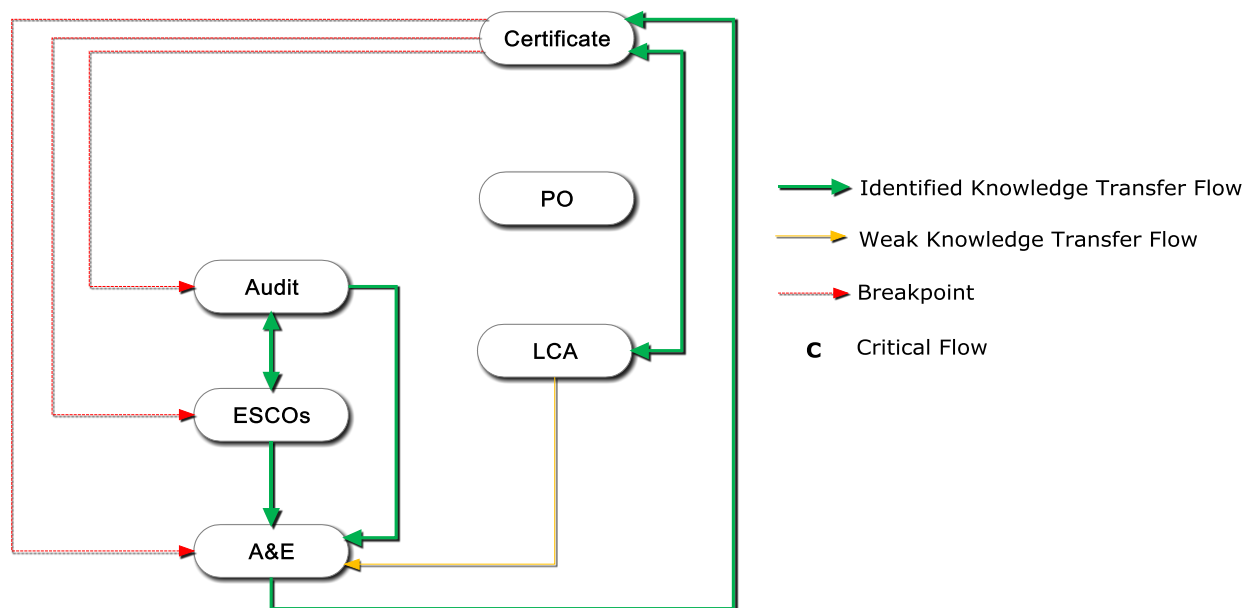


Figure 16: Flow_12. Energy and Retrofitting Services Providers – Quality assurance

The most remarkable informal flows identified are from “ESCOs” to “A&E” and from “LCA” to “A&E”.

4.2.13. Flow_13. Energy and Retrofitting Services Providers – Demand

The main flow number 13 is the one established between the groups of the Energy and Retrofitting Services Providers and Quality assurance. There are four agents involved in this main flow:

- A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),
- Audit: Energy auditing firms,
- ESCO: Energy service companies,
- Demand: Homeowners and building users, occupants (Occupants). Real Estate agents and householders and building managers (BuildManage).

Once again, there are some knowledge transfer problems with the Demand: There is a breakpoint from “Audit” to “Demand”. This flow deserves special attention because it is a critical flow (Audit ⇌ Demand). There are two more critical flows that are working properly (ESCOs ⇌ Demand, A&E ⇌ Demand)

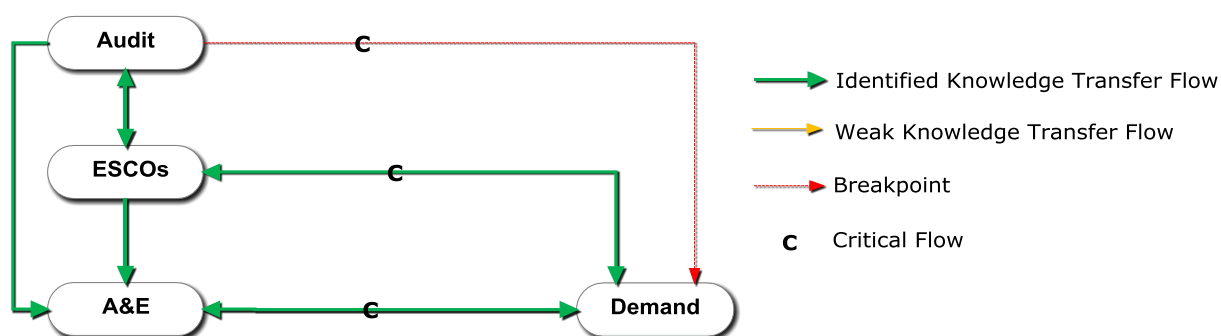


Figure 17: Flow_13. Energy and Retrofitting Services Providers – Demand

Knowledge transfer flows from and to “Demand” are usually informal.

5. IDENTIFICATION AND ANALYSIS OF THE BREAKPOINTS IN THE TRANSFER FLOW

5.1. The Ideal Knowledge Transfer Flows Map

The Ideal Knowledge Transfer Flows Map is described as the existing Transfer Flows Map without weak knowledge transfer flows and without breakpoints, that are necessary but inexistent knowledge transfer flows. All of the Knowledge Transfer Flows between the actors work properly in the Ideal Knowledge Transfer Flows Map.

The comparison between the Ideal Knowledge Transfer Flows Map and the current Knowledge Transfer Flows Map allows identifying the main knowledge transfer problems that must be analyzed in further sections, in order to draw conclusion and establish recommendations to develop a knowledge transfer framework within the value chain in the EE Sector for building retrofitting in the Mediterranean area.

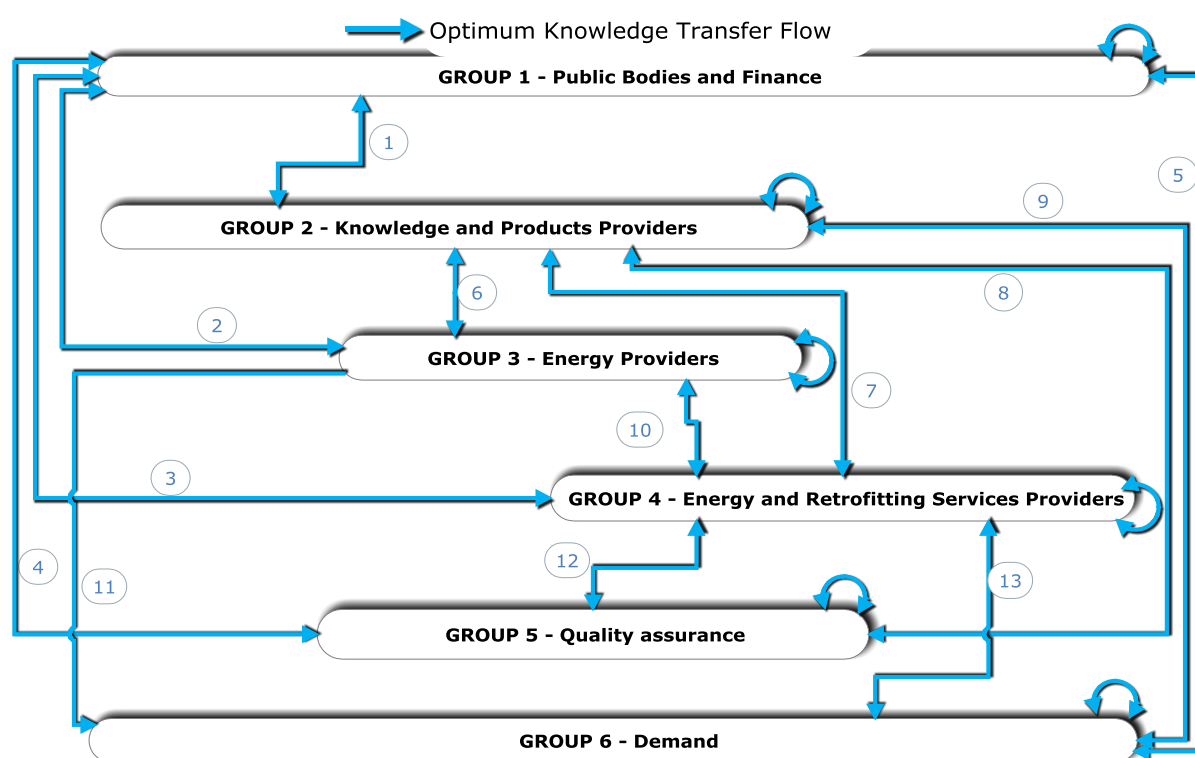


Figure 18: Ideal Knowledge Transfer Flows Map

5.2. Analysis of the breakpoints in the transfer flow

In this section, the breakpoints (→) and the weak knowledge transfer flows (→) are analysed.

It is very important that the flows, especially among those that are close to each other in the value chain, are two-way flows as knowledge transfer should function as knowledge exchange in order to be more efficient and effective. If knowledge transferability is existing in knowledge transmitter and knowledge receiver, there will be the creation of reciprocal knowledge, which helps solve the problem of knowledge transfer.

GROUP 1 - Public Bodies and Finance

As a Knowledge transmitter, this group has properly ways to achieve the knowledge transfer. In this case, the mechanism of knowledge transfer usually includes formal methods.

It has been identified a weak knowledge transfer flow from Public administration and authorities to occupants, real estate agents, householders and building managers that has to be improved. There is also a necessary but inexistent knowledge transfer flow (breakpoint) from demand to Public administration and authorities.

“PubA” → “Demand” → “PubA”

GROUP 2 -Knowledge and Products Providers

The member of the Knowledge and Products Providers Group are involved in most of the knowledge transfer problems detected. Technical solutions developers companies, manufacturer of building elements, building materials and installers are working independently from each other creating fragmented knowledge transfer flows.

There is knowledge exchange among different R&D institutes and universities through joint research programmes, conferences, staff exchange, etc, but the results from the research activity of the R&D group is not easily accessible to the other groups. It has been identified a weak knowledge transfer flow from R&D institutes, universities to manufacturers of building elements and building materials and vice versa. In addition, finance to support R&D is active in the academic/university sector, though financial instruments to encourage the manufacturing sector to engage in R&D are lacking.

“R&D” → “Manufacturers” → “R&D”

There is a necessary but inexistent knowledge transfer flow (breakpoint) from R&D to installers of building systems and building materials. Traditional craftsmen need to have more exposure to R&D innovations.

“R&D” → “Installers”

It has been identified weak knowledge transfer flows from R&D to energy service companies (ESCOs), and from R&D to architecture and engineering companies and vice versa. This shows that more education programmes (e.g. seminars, workshops, in-service training, etc.) are necessary for increasing the knowledge and achieving a better knowledge transfer system.

“R&D” → “ESCOs”
“R&D” → “A&E” → “R&D”

There is a weak transfer flow from installers of building systems and materials to energy auditing firms. This flow needs to be improved. The installers often have enough background and knowledge for establishing an improved knowledge transfer to Audit.

“Installers” → “Audit”

The knowledge transmission between installers and technical solutions developers companies and software developers should be improved but can't be considered non-existent since the installers to perform their work depend increasingly on performing calculations with dedicated software. Also software developers create programs that come to meet industry needs of installers.

“Installers” → “TechSol” → “Installers”

Breakpoints from technical solutions developers to R&D and to Energy auditing firms have been identified. This could be improved by increasing the awareness of TechSol on the EE retrofitting issues.

“TechSol” → “R&D”

“TechSol” → “Audit”

The installers through their corporate entities are represented on committees that set standards in national organizations but the knowledge transfer flow is still weak.

“Installers” → “Standard”

The knowledge transmission between installers and manufacturers should be improved. There is a weak transfer flow from installers of building systems and building materials to manufacturers of building elements and vice versa.

“Installers” → “Manufacturers” → “Installers”

There are also necessary but inexistent knowledge transfer flows from installers to renewable energy companies, architecture and engineering companies and certification bodies. There is also a weak transfer flow from installers to demand. As long as installers do not be good knowledge receivers, they will not be good knowledge providers.

“Installers” → “RenewEn”

“Installers” → “A&E”

“Installers” → “Certificate”

“Installers” → “Demand”

Manufacturers should improve the knowledge transmission to Life cycle assessment bodies.

“Manufacturers” → “LCA”

GROUP 3 - Energy Providers

It has been identified a weak knowledge transfer flow from Renewable energy companies to Standardization bodies. Renewable energy processes has to be standardized and this process needs the contribution of the Renewable energy companies.

“RenewEn” → “Standard”

The members of the Energy Providers Group have knowledge transmission problems with the occupants, Real Estate agents, householders and building managers. There are weak knowledge transfer flows from Renewable energy companies and Energy distributors to Demand. It has been detected a breakpoint or inexistent flow from Electric Power Transmission Grid Operators to Demand.

“RenewEn” → “Demand”.

“EDist” → “Demand”.

“GridOp” → “Demand”.

GROUP 4 - Energy and Retrofitting Services Providers

Knowledge transfer flow from Architecture and engineering companies to R&D institutes and universities is a weak flow, and there is a breakpoint from Architecture and engineering companies to Manufacturers of building elements and building materials. These flows could be improved by in-service training and also chambers of A&E should be included in obtaining an efficient EE retrofitting education programme for professionals.

“A&E” → “R&D”

“A&E” → “Manufactures”

There is a breakpoint from Energy Auditing Firms to Public Administration. It is necessary to improve the knowledge transfer in that field in order to promote Public Administration knowing on the company's reality.

“Audit” → “PubA”

“Audit” → “Demand”

Transferring quality information on actual energy consumption of buildings to end users can support the implementation of initiatives to promote the energy improvement.

GROUP 5 - Quality assurance

There are breakpoints from Certification Bodies to Energy Auditing Firms, ESCOs and Architecture and Engineering Companies. To improve that knowledge flows, it is important to inform Energy Auditing Firms, ESCOs and Architecture and Engineering Companies on the importance of the Certification systems.

“Certificate” → “Audit”

“Certificate” → “ESCOs”

“Certificate” → “A&E”.

There is a weak knowledge transfer flow from Life Cycle Assessment Bodies to Architecture and engineering companies, although workshops and conferences are organized in order to update Engineers about life cycle assessment matters. This flow has to be improved.

“LCA” → “A&E”

GROUP 6 – Demand

Occupants, Owners and Build Manage have weak or no knowledge of EE retrofitting. They need to know better where to find the information on EE retrofitting, and who is qualified to provide information and reliable advice, and they should be encouraged to seek this. There is an issue of motivation, but also awareness. Occupants and owners usually share their knowledge (based on their own experience of EE retrofitting) with other occupants and owners and they sometimes trust each other more than professionals that work in EE field. Knowledge transfer from installers to occupants, owners and building managers is still too weak and should be improved.

“Installers” → “Demand”

Installers are often who propose the efficient retrofitting solutions to building owners and this is a critical flow because sometimes the knowledge transfer to the installers have been weak and they are not able to communicate the benefits to the owners.

The importance and benefits (including economic ones) of EE retrofitting, as well as funding opportunities are still not communicated to owners/occupants well enough by public authorities, subsidisers, renewable energy companies and everybody who promotes/ offers solutions to final users.

“PubA” → “Demand” → “PubA”
 Demand” → “Manufacturers”

Occupants and owners of the building should be informed on the financial supports from the Public administrations, banks, etc

The weakest points are the last in the chain (installers/builders and end users). Installers and builders are not sufficiently up to date with market developments and best practices. And for end users the costs are usually before any other criterion of energy efficiency though these improvements involve medium to long-term savings outweigh the costs of installation. It is critical to facilitate the communication of the efficient retrofitting benefits in this chain end.

The importance of EE retrofitting should be communicated by a proper education system build by Universities, Public Administrations and Chambers. More seminars, workshops, training programs, research programs are necessary in order to improve the knowledge transfer flow between agents.

6. SWOT

SWOT Analysis is an evaluation of an application, system or any study or work on project scale. This kind of evaluation might be performed for any type of project by determining the Strengths, Weaknesses, Opportunities and Threats in a 2x2 SWOT matrix. While Strengths and Weaknesses constitute Internal Factors group, Opportunities and Threats constitute External Factors group.

Terms defined as:

- Strengths: the parts or characteristics of a project or business that can be considered as an advantage,
- Weaknesses: disadvantageous parts that should be overcome in order to reach the aims of the project (or business),
- Opportunities: are the external factors that can be used for overcoming the weaknesses,
- Threats are the external factors that can cause trouble for the project.

The intersection of each component from Internal and External Groups represents different point of views. For example, the intersection of Strength which is a component of Internal Group with Opportunity which is a component of External Group shows “Strategies to make use of Opportunities through Strengths”. The rest of the intersections would be similar to example given above, accordingly.

Task 2.4 is performed by EU-CEO, based on Task 2.2 the knowledge transfer flow (KTF) status and Task 2.3 the breakpoints in the transfer flow. Thus, the SWOT Analysis may indicate how to overcome the weaknesses or disconnections between the key players and how to convert the external opportunities to perfect KTFs.⁸

Strengths

- Knowledge transfer flows (KTF) from Public Bodies & Finance, ESCOs, POs and EDist are quite strong.
- The KTF from Standard is strong and EE-Retrofitting Directives are already constituted.
- The KTF between PubA & Finance and all value chain members under the Quality Assurance group is highly strong.
- Energy Providers and Energy Service Providers relationship is strong.
- The Energy Price increases exponentially.

Weaknesses

- KTFs from Installers, i.e. feedback, which should normally exist, lack 90%.
- The low connection between Installers and R&D, TechSol, Manufacturers, Audit prevents meeting the demands of market.
- Government bodies, Universities, Chambers and other non-governmental organizations are not very active in creating awareness.
- Lack of Governmental funding for promoting collaborations between R&D and Manufacturers.
- Low awareness of Occupants and A&Es on EE-retrofitting measures.
- Lack of demand for changes in the regulations from Occupants.
- Lack of connection between same actors in different countries (in the Mediterranean).
- Lack of knowledge on how to reach reliable information on retrofitting technologies.
- Unconcerned approach of R&Ds for transferring the scientific research results throughout the value chain.

Opportunities

- EE-Retrofitting is a concept which allows the modifications or changes of relevant new regulations.
- New energy efficient technologies can be used and evaluated on present buildings.
- Highly improved KTF of PubA and Finance bodies may provide a common platform to gather the value chain members.
- Governmental organizations' ease of creating budget for EE Retrofitting.
- Role of technical chambers, e.g. Chamber of Engineers, Chamber of Architects, etc. in improving knowledge transfer flow.
- Wide applicability area of EE Retrofitting for vast majority of buildings.
- Opportunity for developing new business models in this sector.

Threats

- Lack of KTF from installers obstructs the improvements in EE Retrofitting technologies.
- The fundamental members practising EE-Retrofitting (Manufacturers, Installers and TechSol) are not integrated to the flow chart as it is expected.
- Technological studies progress faster than understanding and applying them to new techniques.
- Economic restrictions prevent innovation in new technological applications.
- Limited interest from local stakeholders due to lacking dissemination initiatives on methodologies, technologies, materials.
- Because of the weak KTF – not reaching the 2020 goals.
- The different regional and local legislations reduce the market dimensions (fragmentation).
- Lack of interest of the business sector in long term environmental issues.
- The capacity of SMEs to actively engage in knowledge transfer activities is limited by constraints in human and financial resources.

Figure 19: SWOT Analysis

INTERNAL FACTORS		EXTERNAL FACTORS	
INTERNAL FACTORS	Strengths	Opportunities	Threats
	Weaknesses		
	<p>Strategies to make use of Opportunities through Strengths</p> <ul style="list-style-type: none"> • Since EE-Retrofitting is a concept being scrutinised, well-planned assessment of methodologies, technologies and materials may provide a substantial framework for future applications. • Performing technological studies on present buildings will reinforce R&D in the retrofitting field. • Planning new initiatives for reducing the energy cost. 	<p>Strategies to make use of Opportunities to minimize Weaknesses</p> <ul style="list-style-type: none"> • Engagements and new regulations had to rely on feedback from Installers. • Technological studies on present buildings can create a paradigm of collaboration for R&Ds and TechSol, Manufacturers, A&E and Audit experts, thus, ensuring a more effective knowledge transfer. • Considerably high KTF from PubA enhances awareness. • Connections between PubA and Finance bodies may result in new financial incentives, thus, enhancing collaborations among different parties. • The increase of awareness and apprentices of Installers and A&Es could be organised through vocational training programmes offered by Chambers or specialised educational institutions. 	<p>Strategies to prevent Threats through Strengths</p> <ul style="list-style-type: none"> • Organised dissemination and publicity for local stakeholders through portals dedicated to retrofitting. • Boosting networking actions and activities bringing together governmental organizations that have been dissociated from the value chain. • Increasing collaboration between the value chain members may ease the new technological developments needed by the market. • Development of high school curricula presenting retrofitting matters from the early stages of formal education. • Training of Installers by the financial support of PubA and Finance Bodies.
		<p>Strategies to minimize the potential dangers lying in sector where Weaknesses meet Threats</p> <ul style="list-style-type: none"> • Low governmental supports and high expenses of new technologies may restrict EE-Retrofitting applications. • Lack of KTF from separated members (Installer, Manufacturer and TechSol) prevents reflecting new technologies to applications. • Use of successful demonstrators for dissemination/awareness purposes. 	

Figure 20: SWOT Analysis. Strategies

Abbreviations used in the SWOT Analysis:

A&E: Architecture and engineering companies (civil, mechanical, electrical, environmental),

Audit: Energy auditing firms,

BuildManager: Real Estate agents and householders and building managers,

Certificate: Certification bodies,

Climate: Meteorologists,

Economy: Economists,

EDist: Energy distributors,

ESCO: Energy service companies,

Finance: Banks, Financial Agents, Promoters, Subsidizers,

Government: Government,

GridOp: Electric Power Transmission Grid Operators (GridOp)

Installers: Installers of building systems, building materials,

LCA: Life cycle assessment bodies,

Occupants: Homeowners and building users, occupants,

PO: Intellectual property bodies and patent offices.

Manufacturers: Manufacturers of building elements, building materials,

PubA: Public administration and authorities (ministries, municipalities, etc.),

R&D: R&D institutes, universities,

RenewEn: Renewable energy companies,

Software: Software developers,

Standard: Standardization bodies,

TechSol: Technical solutions developers companies.

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