Final Dissertation Submitted For the Degree of Msc In European Construction Engineering At The Universidad De Cantabria

Management Analysis For Special Competitions Based On ISO 9001:2008 Quality Management Systems, ISO 1400:2004 Environmental Management Systems And OHSAS 18001:2007 Occupational Health And Safety Management Systems.

Case Study: Solar Decathlon Europe 2014.

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ABSTRACT

This paper aims to analyze the managing condition of the participating projects in the competition Solar Decathlon Europe 2014, depart from that, a suitable integrated management system is proposed. The analysis was accomplished due to the design and application of a questionnaire based in ISO standards, concerning quality, environmental and health and safety management. The results showed the weakness regarding management system, this means the lack of integrated policy, internal structure, definition of processes, risk identification and continuous improvement. The paper presents the possibility of improve the results of projects in competitions by having a management framework.

KEYWORDS

Integrated Management System, ISO standards, OHSAS, Sustainable Construction, Solar Decathlon Europe, Quality Management System, Environmental Management System, Occupational Health and Safety Management System.

RESEARCH STATEMENT

This final dissertation is the outcome of and individual effort of the author with a common interest with the academic supervisor which is to improve the management and therefore the performance of the teams who want to participate in future edition of the Solar Decathlon Europe or other competitions of the same nature.

The enthusiasm for the development of this paper emerge after the experience of the team "Equipe VIA-UJI" from the Universitat Jaume I (Spain) and VIA University College (Denmark) in the edition of 2014 of the SDE. Depart from their participation in the competition was possible to know, from their faculty advisor the lacks regarding a management system to conduct in a better way their work within the contest.

That is why the author has developed the study in-depth the of projects to find weakness regarding management system and propose and suggest a model adapted to the necessities and gaps found in the projects in order to improve their performance and their result in the competition, focused in the preservation of the quality of the product, the preservation of the environment and the health and safety of those involved in their activities.

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LIST OF ABREVIATIONS

BS: British Standards

IMSs: Integrated Management Systems

ISO: International Organization for Standardization

OHS: Occupational Health and Safety

OHSAS: Occupational Health and Safety Assessment Series

SDE: Solar Decathlon Europe

CHAPTER 1. INTRODUCTION

1.1 Background

The principal aim and purpose of the Solar Decathlon Europe (SDE) is to raise the awareness in the participating students and the public attended to the event about the profits from the use of renewable energy, sustainable construction and the innovative solutions for it. Almost every activity done by the team is focused on reach the first place in the competition taking into account the objective of the SDE organization, but what about the management system of that kind of projects? Which model should be follow? And what kind of profits could bring to the project?

The SDE competition has very specific rules about how the project has to be developed but none of them gives a guideline related to the managing of the project regarding quality, environment and health and safety. In spite of the main principle of the contest is to make known to the general public and the decathletes the possibilities to perform a passive house in order to improve the role of the construction in terms of the preservation of the environment and reduce the carbon footprint by incorporating renewable energy technologies to the architectural design of the prototype.

The teams involved in the competition acts like an organization, with the specific aim of produce a prototype to comply the rules and their principles in order to win the competition. Nowadays one of the key factors for the success of any kind of company or organization is the implementation of an integrated management system, and that success is determined as the adherence to the structure of that system, the project scope, the cost of the project and the schedule of the project (Cheung, 2010).

The literature review done for this dissertation highlights a lot of case studies which evidences the benefits of the implementation and maintenance of a managing model based on standards.

The integrated management system got its start in the 1900s with the launch of the ISO 14001 (Environmental management systems) its adoption and certification increased considerably till then, afterwards others management system standards have been released for different purposes but in congruence with the first one, since then, the idea of an integration was born in order to obtain more benefits from the union of them. The implementation of an integrated management system should be in a systematic way, therefore the need of a model based on standards. (Ferguson, et al., 2002)(Gianni & Gotzmani, 2015).

Nowadays and integrated management system is considered an important element for a good performance and generally is supported by thee main pillars, the quality, the environment and the health and safety (Zutshi & Sohal, 2005). Although some other management systems could be integrate, such as risk management, social responsibility and energy management among others.

The review paper done for the purpose of this very paper highlights that the incorporation and adoption of a management system will enhance the efficiency of the organization and it will bring a sense to the company by having their own policies, statements and objectives, as well as improve in the internal structure and communication.

The analysis is based on the data collected from a sample of the project manuals of the participating prototypes in the event of SDE 2014, the data gathering was done with the help of a questionnaire designed according to the ISO standards requirements. The proposal was done according to the gaps found in the projects thanks to the analysis and was based in the standards mentioned before and in compliance with the rules of the competition.

The results and conclusion of this paper could lead to organizational benefits for future participants of the SDE competition as well as other projects involved in competitions with similar architectural and engineering requirements. On the other hand, the findings could also lead to further researches to concentrate the efforts in the managing of the competition itself, to improve the model proposed or even enclose other standards.

1.2 Aims & Objectives

The Solar Decathlon Europe is an international competition between universities from all over the world, in which the aim is to design and build a sustainable house able to operate properly only with solar energy and in addition the project should be in compliance with the rules of the contest. The organization of this competition has stablished very specific rules related to structural and architectural issues, energy efficiency, communication and awareness of the projects to the population, the innovation in the project and the comfort and proper functionality of the house.

In spite of the competition magnitude, with so many participants, sponsors, universities, and governmental agencies involved and all the rules and target to be achieved, it has not stipulated requirements concerning to the project management or a model to conduct the managing tasks. That's why they need a proper management system in order to guide the way in which the project is conducted.

The participating teams in SDE 2014 have developed their projects without any management standard or system. Due to the complexity of the work, it could be recommended to implement an integrated management system, taking into account quality, environment and health and safety, which are already between some of the principles of the SDE Organization. Therefore, this final dissertation will propose a guide for special projects in order to improve their organization according to the following standards: ISO 9001:2008 Quality management systems, ISO 1400:2004 Environmental management systems, OHSAS 18001:2007 Occupational health and safety management systems.

In order to accomplish the purpose of the research, some objectives must be achieved:

- The first objective is to produce a questionnaire based on the ISO and OHSAS standards related to quality, environmental, health and safety managements management.

- The next objective is to analyze the content of the project´s manuals and identify the weakness regarding management standards, throughout the results thrown by the survey.
- Finally, based on the analysis of the participating projects of SDE 2014 and the literature review, the last objective is to propose a managing model for the implementation of an integrated management system for the future participants in Solar Decathlon Europe competition.

1.3 Work/Research Methodology

The character of this paper is purely investigative, so in order to reach the objectives presented before, the following methodologies will be applied:

- Bibliographic review: for the development of the research is important to find accurate information, such as articles, books, web sites or any other research to provide support to the information exposed to it.
- Software program: a program will be used to develop the questionnaire in order to compare the project contents with the standards.
- Questionnaire: A survey based on the general requirement of the ISO and OHSAS standards will be designed and applied to the participating projects from the Solar Decathlon Europe 2014.

1.4 Limitations and Scope

For the purpose of this final dissertation the scope is defined for the analysis of the 19 project manuals published in SDE 2014 official web site. 20 projects were participants and 5 were invited or substitutes, but only 19 prototype's manuals were posted.

Maybe the leak of information in the manuals could represent certain limitations. These manuals are elaborated sticking to the rules and requirements of the competition, therefore some information regarding the management system of the project could be avoided by the team. Any other activity done by the team regarding the management of the project such as reviews, internal communication structure or the internal logistic could be not represented in the manuals summited to the organization.

1.5 Dissertation Report Outline

The present final dissertation consist of 5 chapters in total with the very aim of reaching the objectives targeted named before, all of them are listed and explained below:

- Chapter 1. Introduction

  The first chapter contents the purpose and objectives of the final dissertation, it explains the importance of the subject, which are the objectives to be achieved and how they are going to be meet and analyze, as well as the limitations and scope in which the research is focused on.

- Chapter 2. State of the art

  The research move on with an outline of the state of the art and background information needed to understand and know the tendency in the study subject. Includes the essential information about the SDE competition and a literature review of articles, theoretical approaches and others researches related to the integrated management system based on the ISO standards, its benefits and how is being applied in other organizations and competitions. This chapter supports the proposal of the paper and, in turn, gives to the lector the context information for a better understanding.

- Chapter 3. Methodology

  This section explains the method used to carry out the investigation, the analysis throughout a survey was applied to the participating projects. It also explains the composition of the survey and how was designed.

- Chapter 4. Findings

  The next step of the study consist of the description and interpretation of the results of the survey. The findings are revealed in pie charts showing the percentages of affirmatives and negative answers in order to demonstrate the tendency follow for the projects. This section deduce, according to the analysis of the results, the lack of requirements to be achieved in an integrated management system based on standards. It also content a brief description of the management analysis of each project.

- Chapter 5. Proposal of an Integrated Management System Adapted to the Projects Participating in Solar Decathlon Europe Competition

  In order to comply with all the objectives sets, an integrated management system for the project participating in the SDE was proposed in the fifth chapter. The model is done based on the information content in the previous literature review and according to the weakness found in the projects regarding the requirements of the ISO and BSI standards of quality, environmental and health and safety management system. This chapter comprises the necessary identification of the processes and tasks involved in the project realization and the systematization of this information in order to obtain a model to manage the work done by the teams.

- Chapter 6. Conclusions

  The general conclusions are expressed in this section. The final discussion aims to show and summarize the outcomes of the final dissertation based on the preceding chapters, in this way is possible to meet the objectives and requirements of this paper.

  The conclusions deal with the inference of the information contained in the state of the art, the synthesis, analysis and description of the findings and the integrated management system proposed for the future participants of the SDE.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

Nowadays the environmental care and the energy saving issues are crucial on engineering and architectural projects, that is why the need of technological and educational development of professionals, manufactures and suppliers as well as the propagation of information about these innovations (Soriano, et al., 2014).

Therefore the realization of certain kind of educational activities, such as competitions and contests with the aim to enhance the initiative of students and professionals in order to develop new ideas and concepts that could offer solutions to the actual problems in construction. One of those efforts is the Solar Decathlon Europe (SDE), therefore, this final dissertation is focused on the experience of projects participating in the edition of 2014 and its analysis from the management point of view.

The following literature review consists of three sections, the first one comprises the description of SDE 2014, the aims of the organization, the contests, the rules stablished by them and an overview of the competing projects of that edition. In the second place a review is undertaken of studies and articles about the implementation of the integrated management system as a model for managing practices as well as an overview of the ISO and BIS standards. Finally the third section is about the adoption of management systems in other kind of competition and their experiences.

2.2Solar Decathlon 2014

The SDE is a multidisciplinary competition, including civil engineering, electrical engineering, computer science and architecture as the most relevant. According to Solar Decathlon Europe Organization (2014) the main purposes of the contest are:

- To raise participating students´ awareness about the profits from the use of renewable energy and sustainable construction and the innovative solutions for it.
- To encourage the building industry to choose fabrics and systems that lessen the environmental impact without compromising the user comfort.
- To inform and educate the public about the role of renewable energy.
- Shake up the order of intervention with a cost-effective criteria.
- To foment the use of solar technologies.
- To raise the attractiveness of solar integration in state of conventional building materials.
- To demonstrate the appropriate performance and comfort of passive solar houses.

Universities from every nation can compete if they fulfill the requirements as participants. The teams must design, build and run a full scale solar-powered house to be assembled, exhibited and disassembled in a particular event.

The inaugural edition was in 2002 as an initiative for the Department of Energy of U.S. but with its success and due to an agreement with the Spanish Ministry of Housing, others

editions have been made in Europe. Thanks to that and in cooperation with Universidad Politécnica de Madrid, where has taken place tow editions, 2010 and 2012 (Navarro, et al., 2014). The case study is centered in the Solar Decathlon 2014 hosted in Versailles, France. La Cité du soleil was created just for holding the event.

2.1.1 Rules

In the edition of 2014 the SDE refined the requirements to be met by the projects, in order to evaluate all the aspects of the sustainable future house, the organization meant to focus on:

- Density issues
- Problems of mobility
- Sobriety, when consuming and producing
- Innovation
- Affordability

The contest is aimed to the sustainability, innovation, research, and therefore, the organization wants the team to design and build their projects as well as enhance the systems integration and generation of knowledge on sustainable construction. The following rules are intended to reach those objectives, but also to promote a fair competition.

2.1.2 General Rules

In order to set and determine the rules, steps and conditions that every team must follow and respect, the organization of the SDE 2014 in France published the regulation of that edition, due to, it could be some modification from one year to another. This section includes the general aspects of the competition, regarding the organization, the participating teams, the event and the general conditions contents on the regalement mentioned before, such document was submitted to every team and it is also available in the official website of the competition (Solar Decathlon Europe, 2014).

The general rules point out the communication plan between the organization and the teams, being the SDE workspace the main communication tool, there was also emails, conferences calls, meetings and postings.

It also says that penalties could be apply to those teams committing rules infractions, the penalties consists on removing points to the teams, but there is also the opportunity to protest throughout a written report.

Other issue treated in this section is the contact information of the team officers and contact information, which must be listed in a table with the information of all the team members. The safety and the conduct of the teams in the competition are other subject matters included in this section.

Throughout the rules the organization had established that all teams had lots of 20.0 m by 20.0 m and a stock area of 20.0 m by 10.0 m for the assembly and disassembly phases. The

support of the prototypes should be low-impact footings, designed in order to comply the soil bearing.

The assembly and disassembly plan is not mandatory but its submission can add points to the teams, is also noted that this process must be video record for security and as audiovisual-support document for the team.

Regarding the construction equipment the rules says that truck-mounted cranes, trailers, semi-trailer trucks and other kind of heavy vehicles are allowed if they are necessary and taking into account the internal circulation plan. The waste disposal and the site cleaning would be also evaluated.

About the working system of the team, the organization has only out pointed the need to have a construction manager for the site operations, all the phases or periods must be reflected in the competition calendar of the teams and allow them to work 24 hours per day with working shifts. The solar envelope in order to protect the teams for the sun is also mandatory and is detailed in the rules.

Regarding the projects, this section has established that each team must submit structural designs, drawings and the electrical and photovoltaic design must be signed and stamped by licensed professional, approving that all the specifications met the SDE building code.

There are also some specification about the maximum architectural footprint and the minimum and maximum measurable area. The first criteria defined that the footprint cannot exceed 150 square meters and the second criteria says that the measurable area should be between 45 and 70 square meters for the story houses and a maximum of 110 square meters for multi-story housing units. In spite of the entrance of the house can be located on any side of the house, the route from the entrance to the main street shall be provided.

The SDE organization has established the project´s minimum requirements in order to participate in the 10 contests of the SDE, those requirements are the followings:

- Appliances
- Workstation
- Public area for dinners
- Public areas such as; living room and kitchen for the exhibition
- Accessibility requirements
- Interior and exterior lighting

The only sources of energy use for the operation of the prototype during the event are the solar radiation for the renewable energy system and small primary batteries, but the last one is limited to smoke detectors, remote controls, thermostats, alarm clock backups and other small devices. For other types of consumptions the organizers provided the village with and electric power grid that provides AC power.

The general rules contents others specifications about the water delivery and water removal for the contest purposes and in accordance with the water budget summited by the team.

For other purposes the team should provide their own liquids, those purposes could be: personal hydration, food preparation, thermal mass, hydronic system pressure testing, small volumes of glycol, deionized water, or other working fluids for thermodynamic systems using working fluids other than non-potable water, Assembly, finishing and cleaning.

The SDE Organization has stablished the factors to be measure and monitor during the execution of the projects in several periods. The next picture shows main tow areas to be monitored. The monitoring could be continuous or in a punctual task. This control includes the use of sensors, wire routing, in situ tests and real life condition experimentation.

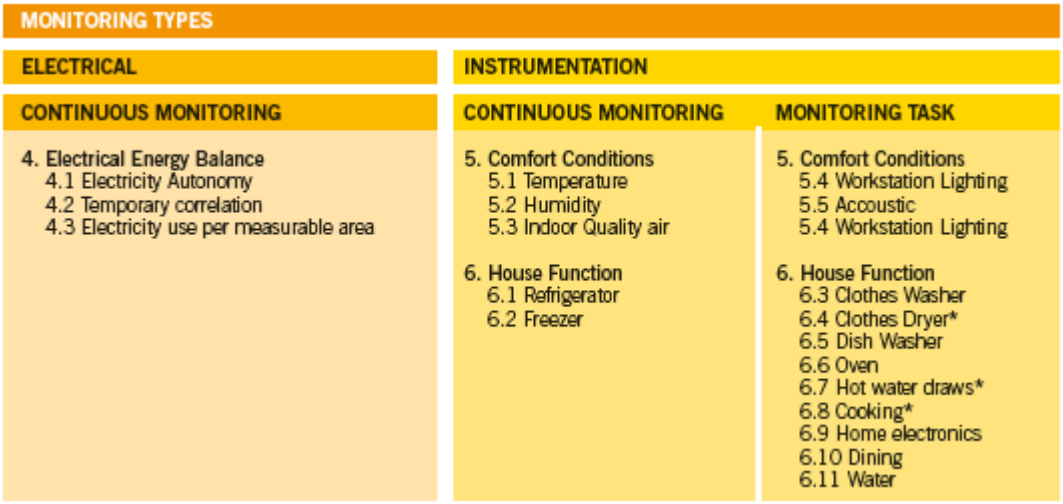

Figure 1 Monitoring types ((Solar Decathlon Europe, 2013)

The rules published by the organization also has guidelines for the registrations of the event and the requirements that the team must comply to have access to the competition. The regulation also stated the conditions to use the SDE 2014 Logo in the materials for the propagation of information, the visual identity manuals and in the project manuals.

Regarding the sponsors and supporting institutions the organization has stablished that each team must look for and select companies or institutions to help them support their projects and purposes and both of them must follow and respect the rules. The sponsorship will be only between the team and the company, there will be any contact with the SDE organization. The name and logo of the sponsor should be recognized by the team by including it in the project manual taking into account some issues and conditions specified in the regalement.

The document also point out the basic logistic that the team must do, such as uniforms, transport of the people, the materials for the house, the tools, the equipment, supplies and so on. The team is also responsible for their accommodation, lodging, food and beverages and they must cover all the necessary costs.

Finally, each project is inspected according to a schedule for compliance with the rules and building code during the final phase of the competition in order to participate in the following days of contest.

The guidelines for the contest week, which is the most important event of the competition, make reference to the occupancy rule, this means that no more than six people may be located in the house at any time, except during the Dinner party organized by the team and some special people, such as photographers, reporters and authorities from the SDE organization. During this week the decathletes should operate the house and participate in all the contests. The public tour for the exhibition of the house is organized by the team as well as the information brochure or handout, the design of the tour route inside the house and the food and beverage for the general public.

The information of the house must be adapted to all kind of spectators, general public, professionals, undergraduate, teenagers and children, therefore, it could be more than one tour route and it could be shorter or longer and taking into account the accessibility and safety of the visitors. There are some special tour called, jury tours, in order to show and demonstrate all the possible configuration of the prototype.

At last, all the construction documents; drawings, specifications and the projects manual must present the last design changes that might occur during the assembling of the prototype, any inconsistence between the final project and construction document should be corrected and summited to the organization.

2.1.3 Contests

The aim of SDE is to evaluate 5 principal areas in the project: architecture, energy, comfort, social-economy and strategy, which are distributed in 10 contests evaluated by a panel of experts. A successful prototype must ensure 1000 points in total to win the following contests (Navarro, et al., 2014)(Solar Decathlon Europe, 2014).

- Architecture: related to the assessment of the design coherence, the flexibility and maximization of space and the integration of technologies and bioclimatic strategies.
- House functioning: this section evaluates the functionality and efficiency of the house, it must achieve the demand of nowadays society.
- Engineering and construction: evaluation of the structural phase, the envelope, electricity, plumbing and solar system of the prototype.
- Communication and Social awareness: assess of the communication plan for the team in order to make note the project, the team and their individuality as an establishment.
- Energy Efficiency: evaluation of the conception and mapping of the solar system for the reduction of energy use.
- Urban Design, Transportation and Affordability: Evaluate the integration of the proposal to the social and urban context.

- Electrical Energy balance: measures and evaluates the houses´ electrical energy self-sufficiency and efficiency and assessment of their balance.
- Innovation: respect the innovative aspect of the project, focused on new ideas that may cause an impact on the performance of the house.
- Comfort conditions: Considers the interior comfort provided due to the control of the temperature, humidity, acoustic, lighting, quality of interior air and so on.
- Sustainability: measures the effort regarding environmental issues.

In spite of contest specifications, none of the rules or evaluation topics are related to the management of the project itself, the internal processes or activities or the monitoring of them.

2.1.4 Deliverables

The third section of the SDE rule makes reference to the documents, such as drawings and other materials that the teams must send to the organization following the schedule and in a specific format. This section also specify the criteria for shipped submission and the electronic submission and establish a system to naming all the files to be summited.

According to the rules of the SDE 2014 the teams must follow the deliverables phases, being the schematic design documentation the first one which consist on the demonstration of advance, targets and goals of the proposal. The second deliverable is the dissemination material of the teams for the project diffusion and the organization of events and activities related to the contest.

On the third stage the teams must has a more developed and detailed projects, with more specifications about the materials, constructive system, equipment, footing, and structure.

The forth deliverable is the construction documentation, it means, the information to define the construction in the event and the overview of all the elements required. This phase should include the assembly and disassembly procedures and must be reviewed by the project manager. With this information will be possible to do a cost estimate too.

The fifth deliverable consist on the update construction documentation in order to send additional information and to update the documentation send before in the fourth deliverable, this will be the documentation evaluated for the jury before the final stage.

The design adjustment documentation content the late design changes that can be summited till the day after the deliverable 5 due date. Finally the seventh deliverable will content the as-built documentation, drawings and specifications of the participant prototype, all changes during its construction must be recorded.

This section of the rules also makes reference to the audiovisual material, the web pages, contact information, sponsors and SDE brand recognition of the team. There is also explained all the documents and drawings to be included in the project manual as well as the template format, the competition rule describes the objective and what should content all the points mentioned below.

1. Cover sheet
2. Summary of changes
3. Table of contents
4. Rules and building code compliance checklist
5. Contest support documents
   5.1. Architecture design narrative
   5.2. Engineering and construction design narrative
   5.3. Energy efficiency design narrative
   5.4. Communications plan
   5.5. Industrialization and market viability report
   5.6. Innovation report
   5.7. Sustainability report
6. Dinner party menu
7. Contest week tasks' planning
8. Cost estimate and project financial summary
9. Site operations report
10. Health & safety plan
11. Detailed water budget
12. Electric and photovoltaic chart
13. Construction specifications
14. Structural calculations

2.1.5 SDE Building Code

The building code is aimed to ensure the public and participant´s health and safety and its compliance is mandatory for the participation of the team in the competition. The general criteria of this section is that the participating universities have to use the building code and regulations of their country due to the similarity between them, taking into account that the scope of the application is a single-family home and public building currency. The only exception is about the health and safety considerations, in which the French regulations ware applied.

In order to probe that the prototype complies with the codes of the origin country and it is safe for the public in the event, each team has summited a certificate of compliance signed

by the faculty advisor. According to SDE organization, the projects also has to include a risk analysis, making suggestions and mitigation actions.

This section enclose some specifications about the fire protection of the house, such as the reaction to the fire of the construction for the interior propagation spreading, the fire protection systems and the fire resistance of the structure.

The safety of the prototype during the use is very important for the exhibition of the house during the event, the public tour routes of the house should be accessible without any kind of obstacles and it should be adapted for handicapped people.

Regarding the structural safety, the organization has stablished some guidelines for the electricity distribution network, connected to the photovoltaic system in a single-phase configuration, with a normal voltage operating range and must be in compliance with the corresponding international standards. In order to provide the general information of the system´s design the project manual should have a technical report with the design specifications and drawings of the system.

The considerations about the health and safety issues are stablished in the general rules of the competition, but they are contemplated also here. The organization make every team responsible for the safety of the parties in all time during the project, therefore they must develop a plan considering the health and safety requirements in every phase of the competition (previous works at university, decathletes training, transport, preparation, assembly, executing, maintenance and disassembly) as well as comply with the European union and/or the French law for the prevention of labour risks.

In order with the aforementioned the teams must define safety measures from the analysis of the assembly, maintenance and dismantling of the house. The project must be breakdown into work units and the tasks, agents and risks involved in it must be identify.

Among other procedures, the organization has also stablished the realization of a health and safety emergency plan in order to prevent and solve any accident during construction works, this plan explain and describe the analysis mentioned before, it also should content the health and safety report, drawings and specific terms and conditions documents indicating procedures for accidents, how they must be prepared before star working and measure to take into account during the construction works.

The team must prepare themselves departing from the health and safety report and risk analysis by receiving an appropriate training, machinery, tools, personal protective equipment, collectives protection, driving licenses, attend first aid courses and so on. During the construction works of the prototype the teams must follow the plan designed, identify and provide all the safety controls necessary to ensure a safe environment. This regulation indicates to put in charge a group of people from the SDE organization of the work area for the health and safety supervision, consisting on a HS Coordinator, HS inspector and HS Observers. The HS coordinator is the person in charge of the certification and approval of the HS plan and in other sectors of the competition there are bonus and penalties for the performance of the team during the work.

On the other hand, the team has a HS Coordinator and Safety Officers, the first one has the responsibility of the proper development and enforcement of the health and safety plan designed by the team as well as the health and safety of students, faculties, contacted staff,

drivers, etc. The safety officers has to control, prevent and observe the safety measure compliance.

The working shifts and resting of the members of the team and any other person working for the event is mandatory according to the rules, in order to reduce the tiredness and lack of concentration, preventing accidents in this way. This working shift plan should be included in the project manual of every participating team.

2.2 Projects

To continue with the review, a summary of the projects participating in SDE 2014 is presented in order to illustrate the work carried on by the teams for the even.

- Philéas: By the team Atlantic Challenge. This project is about the complete rehabilitation of the Cap 44, an industrial building erected in 1895 which is presently vacant. With an ideal location on the border of the Loire, the project aims to become a center of urban market garden.

  Philéas intends to create housing, offices and a restaurant which will use vegetable production from the building's rooftop through a double slope photovoltaic glass roof with integrated monocrystalline double glass modules. This one should provide a maximum of natural light in the central atrium of the building and in the farming section located on the roof.

- Ressó: The Catalan project is inspired by the consequences of the real estate bubble which stroke Spain from 1997 to 2007. This team proposed a prototype of low-cost which consists of parallelepiped unit with a supporting structure made of scaffolding.

  The two south façades are covered with translucent polycarbonate in order to generate passive solar energy. Given that the solar energy has to be the principal source of energy for the prototype, the machinery within the house are automatic in order to consume the electricity the moment it is produced. Ressò does not plan to resort to batteries.

- EFdeN: In order to luster Bucharest the project aims to make the city more dense, creating a residential area in an abandoned industrial plot in the Obor district. The prototype is a bioclimatic duplex, equipped with a solar greenhouse integrated on its south frontage and the roof deck hold a photovoltaic system for the energy production which will be stock in batteries. The house is equipped with a home automation to optimize energy saving and thermal comfort, as well as indoor air quality.

- RenaiHouse: with the idea of "rebirth" this project aimed to create energy efficient habitats in the context of rebuilding houses in the Tohoku region, which was devastated by the earthquake and the tsunami of 2011. The RenaiHouse prototype is presented by the team Chiba from the University of Japan.

  Is made of wood and built up of supporting wooden frames and of insulated panels with wool insulation for the floors. Designed under the concept of the "smart house", is equipped with sensors that enable full control energy and air flow in the house. The photovoltaic system is integrated in the east and west façades and also

on the roof deck. The electricity is stored through the battery of an electric car which is able to charge up and discharge in order to deliver necessary currents for other uses.

- Home with a skin: this project proposed the application of a second skin to the typical type of house in the Netherlands since 1963, specifically a solar greenhouse on one of its façades. The rehabilitation project done by the team Prêt-à-Loger seeks to maximize energy and food production with fruit-trees, berry bushes and vegetable plots. It was built with wood panels and equipped with a double skin.

  A home automation will control ventilation, sun protections, lighting and the heating system. The 20 modules of the photovoltaic system are composed of monocrystalline semi-transparent double glasses integrated to the roof and façade of the solar greenhouse.

- The Embrace: the project of the Team DTU plans to densify the habitat in areas to be rehabilitated by constructing an additional floor on top of existing buildings. Its particularity is to articulate the transition from private to public spaces, via a buffer zone protected by a «climate shield». This will be a glassed sloping roof covering thermally insulated private modules, open greenhouses and circulation passageways.

  The prototype presented in Versailles consisted of a wooden frame for private spaces, with an efficient thermal envelope, with prefabricated panels containing two crossed layers of insulation. The slope of the «climate shield» will be covered with two types of modules - blackout monocrystalline modules for heated sections and semi-transparent double modules for open spaces.

- CASA Fenix: the team Fenix was motivated by the reality of Chile's devastating earthquakes, that´s why their project offers a modular and flexible habitat, which can be built by victims in emergency situations which are designed with a wood frame and prefabricated to be easily assembled. The prototype is an alternation of posts and panels, and the envelope, consisting of carried manually light elements.

  The photovoltaic installation is composed of 15 polycrystalline modules placed on the roof using an aluminum frame. Significant energy is used for the production of sanitary hot water, in combination with a solar thermal sensor. Simulated electric consumption comes from the production of this hot water and from the dishwasher. In this way, nearly half of the electricity production can be self-supplied, without another storage device, while the excess is injected into the network.

- TechstyleHaus: this project aimed to revisit the architectural concept of building with solid materials. The goal of the team Inside Out was to conceive a passive house, with organic forms, equipped with a textile sleeve. The project involves the construction of a set of textile buildings which can accommodate nearly forty students equipped with a metallic structure with several textile layers.

  The inside skin is a material of water-resistant Sheerfill fiberglass maintained by a nylon wire network, while a new layer of synthetic fabric will act as an interior finish. The photovoltaic system will be integrated to the roof thanks to the encapsulation of groups of 21 monocrystalline groups in a layer of vinyl. In order to limit any energy

loss, the German-American team plans to resort to power optimizers, managing each set from 63 to 84 cells.

- Adaptive house: The Thai team offers an architecture that adapts itself to natural disasters. The project concerns a construction on two floors with a steel structure, water-resistant material that cannot be deformed. Inspired by traditional Thai architecture, is built on piles in order to support rises of 60cm. The materials are water-resistant, such as bamboo planks and sandwich foamed polyurethane between panels of fiber cement for the insulation, vinyl coating for the internal flooring and laminate for interior finishing.

  The 22 monocrystalline modules will cover 70% of the surface area of the roof, the 30% remaining are available for thermal sensors, hooked up to a peak of four batteries, for a storage.

- Your+: The Swiss project of the team Lucerne seeks to maximize habitable spaces through sharing in the model of residence cooperatives in order to reduce the use of space per person. The interior of the building is distributed into four types of spaces, 'my room', "our room", "your room" and "spaces +". All of them can be occupied by several persons and can have different uses.

  The photovoltaic installation has fourteen monocrystalline modules located in three areas of the prototype. The installation is linked to a pack of batteries to which are added three electric bikes representing an additional storage.

- Casa: The team Mexico UNAM prepared more than a type of "toolbox" habitat for acting on the densification of the Mexico metropolis. Casa is a construction system based on light and prefabricated elements.

  The toolkit provides a system of modular support structures, panel walls and roofs covered with textile isolated cladding for walls and a waterproof membrane for roofing. It also includes a water tank housed in a minitower and even furniture designed according to different hubs.

  The project has three models equipped with monocrystalline modules mounted on the frame and connected to the grid, without a battery, to minimize costs and an ecological footprint.

- OnTop: in order to preserve the quality in the urbanism and keep the balance between habitat density and green spaces, the team OnTop wants to build additional housing on top of the existing buildings, it consisted of five segments interspersed with terraces with light-weight elements and materials. The project is a symbionts of the old building, providing thermal protection as well as a surface energy production. And the new roof has monocrystalline modules and a battery for storage.

- Livedlib: the project by the team Paris intends to add the "plug and play" concept into the context of a building of three distinct elements. The heart of the building in which the production and distribution of the technical services are located. The hubs are connected to "capsules", removable living spaces or offices, dependent on the «port», a connection interface. The capsules are designed to be disconnected,

transported by truck and connected to another hub. The electricity is produced for photovoltaic modules composed of layered superimposed luminescent solar concentrators (LCS) and thin CIGS films.

- Symbccity (NO SOBRA UNA B?): the Spanish team Plateau proposed the colonization of rooftops, and additional floor to old buildings creating a harmonious additional floor to old timber frame buildings, resulting in a new symbiotic living situation. The prototype presented for the competition consists of an apartment designed for two people with a double-glass skin wall.

  The use of multifunctional spaces varies seasonally: in summer, there are shaded terraces with cross ventilation, welcoming vertical vegetation; in winter, the shell can be completely closed by the rotating blades of the roof and thus creating a solar greenhouse.

  The single slope roof provides electricity thru thin-film CIS modules for the studio underneath, which enable quality performance in high ambient temperatures.

- Maison Reciprocity: The project done by the Franco-American team Réciproticé is a modular housing unit, consisting of three components; the urban shell or envelope which is a passive standard insulation. The chord or the heart of house with all the facilities and the Living Brise- Soleil consisting of façade and roof components ensuring climate protection and energy production. For the production of electricity the roof is covered by 20 monocrystalline modules hooked up to batteries for its storage and possible used during the peak production.

- RhOME for denCity: the prototyped developed for the team Rhome is part of the urban regeneration program of the south-east of Rome in order to replace illegal inhabited buildings for ecological small collective houses.

  The reinforced concrete foundation supports a wooden frame structure. The specialty of this projects is the simultaneous integration of photovoltaic modules (flexible monocrystalline modules Solbian with SunPower cells) in the roof and façade, these are integrated into the removable occlusions of the main bay windows.

- Rooftop: the objective of the team rooftop was to invest in roof space as big part of the project within the competition. The model was a studio of wood structure with fully glassed north and south facade in order to take advantage of the natural light also composed of eight automatic, horizontally-placed control panels which follows the sun path, they also can cover the windows during the winter to enhance thermal protection. The roof is entirely covered with thin CIGS film modules.

  The store of energy and the possibility of charging bicycles is provided by the batteries located in the ground floor.

- H Naught: is the project presented by the team Shunya, is a new type of sustainable building as solution for the middle-class. Is a four levels apartment of three rooms each, with a metal framework system boasting a high-performance skin. The rooftop is a terrace place that hold the photovoltaic system compose of monocrystalline panels which at the same time creates shadow for the occupants.

- Tropika: This project was carried out by the team TEC seeking to build a series of four or five residential and commercial buildings adapted to tropical climates and the improvement of urban densification, to counteract the actual situation in Puerto Rico.

  The proposal consists of two-building complex linked by an overhead bridge system. The north façade is predominantly open to facilitate natural ventilation, it also has a unique solar chimney built into the north façade actively enables warm-air evacuation from the dwelling, the external section of it is covered with glass panel which heat the upper section of the house and helps to the natural ventilation. The prototype relies on a glued-laminated wood structure and some polycrystalline solar panels are integrated into the roof for the production of electricity.

  The external section of the solar chimney is covered with a glass panel, used to heat the upper section of the house, thus accelerating natural ventilation and circulation of warm air toward the exterior of the house

2.3. Integrated Management System

According to Bernardo (2014) one of the most important factor for the success of the companies is the innovation, to improve the current situation, and it starts by innovating the managing practices. The same author also highlights that the implementation of an integrated management system is a strategy that leads to the success claimed before, is one of the best management practices when an organization has multiples systems to be managed.

The integration of different management systems means a group of processes interconnected and sharing the same resources in order to reach the objectives, which means a unique system for the satisfaction of all the interests of the organization.

For the efficient adoption of this model is necessary to fulfill the requirement stablished by the ISO Standards and the OHSAS, the organization must reflect and describe their policy, the scope, their internal organization and communication, the procedures and the record, documentation, control and monitoring of them. All this questions should be answered in the Integrated Management Manual, a document which guide the implementation, maintenance and continuous improvement of the system itself (ISO Tools, 2015).

2.3.1 ISO and OHSAS Standards

The profits of implementing the ISO 9001 and ISO 14001 for an integrated management system has been studied before, Tarí, et al (2012)highlights that the management systems standards (MSSs) have truly made a great progress in the companies and organizations that follows them.

These benefits are internal and external, and the prominent among them is the improvement of the productivity, efficiency, a reduction in cost and waste and a systematization of all their processes, without compromising the environmental performance of the activities done by the organization. All the positive effects mentioned before entails the reduction of efforts and bureaucracy.

The integration is easy to do due to the similarities in the structure of the norms, such system brings the alignment of goals, processes and resources. In spite of the implementation of these standards is voluntary, the International Organization for Standardization (ISO) remarks that the number of certifications grows every year. The survey of 2013 point out 1.564.448 certificates until that date (ISO org, 2013).

An integrated management system should also include an occupational, health and safety department, this section is standardized by OHSAS 18001, which provides a set of requirements and steps that helps to enhance the safety and risk management efficiency in all the activities and processes made by the organization (Granerud, 2011).

The use of this guideline helps to reduce accident rates because they are based on the principles of prevention measures more than corrective actions. The main benefits of its implementation were found by Santos, et al. (2013), whom outpointed the improvement of working condition, the compliance with legislation, a better communication for worker about the risks and hazards and the decrease of occupational diseases, among others profits.

If the requirements of ISO standards are looked closely, the actions carried out to ensure quality is the same actions needed to achieve risk management, therefore, OHSAS 18001 is compatible with ISO 9001. Consequently, in order to attain excellence in risk prevention, occupational, health and safety must be integrated into all organization´s decisions and procedures from an organizational and strategic view (Fernández-Muñiz, et al., 2007).

2.3.2 Quality management system (ISO 9001)

With its first edition in 1987 this standard has favored a management system focused in the quality of the services and products provided by the company or organization by specifying the policy, procedures and instructions in a quality manual. Future revisions came with other factors such as the customer and the continuous improvement of the processes (Jorgensen, et al., 2006). The last edition presents a process approach system represented in the figure 2, all of processes are based on customer-focused organizations, leadership, involvement of people, process approach, system approach to management, continual improvement, factual approach to decision-making, and mutually beneficial, supplier relationships. The guide provides several requirements to be accomplished if certification is desired; those requirements are: quality management system, management responsibility, resource management, product realization, and finally measurement, analysis, and improvement (Zeng, et al., 2007).

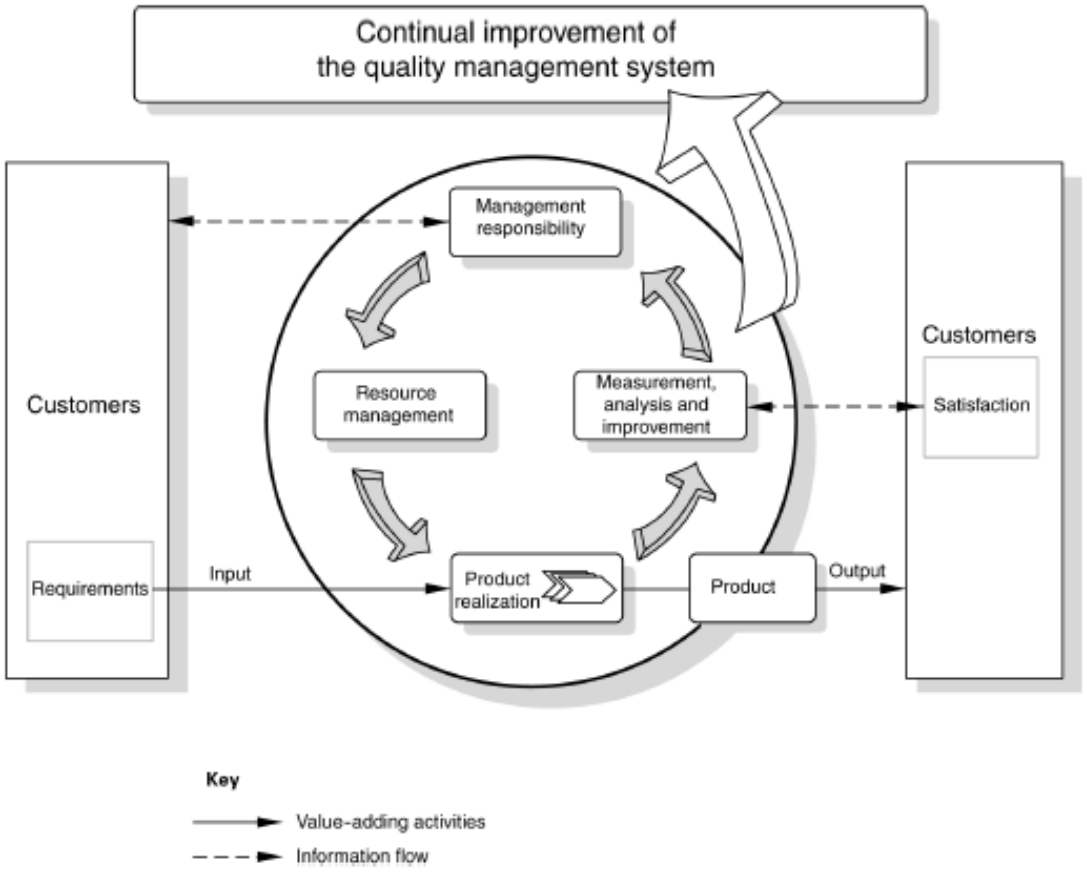

Figure 2 Scheme of the process approach system (International Organization for Standarization (ISO), 2008)

2.3.3 Environmental Management System (ISO 14001)

Published since 1996 has helped to integrate to the organization the management of environmental aspects in coherence with the quality management even though it could be established independently. The adoption of this guide is voluntary as the other standards, and in spite of is compatible with the ISO 9001, this one is focused in the “Plan, Do, Check, Act” principle of the Deming Circle, promoting to the organization the control of the environmental impact of their activities or products.

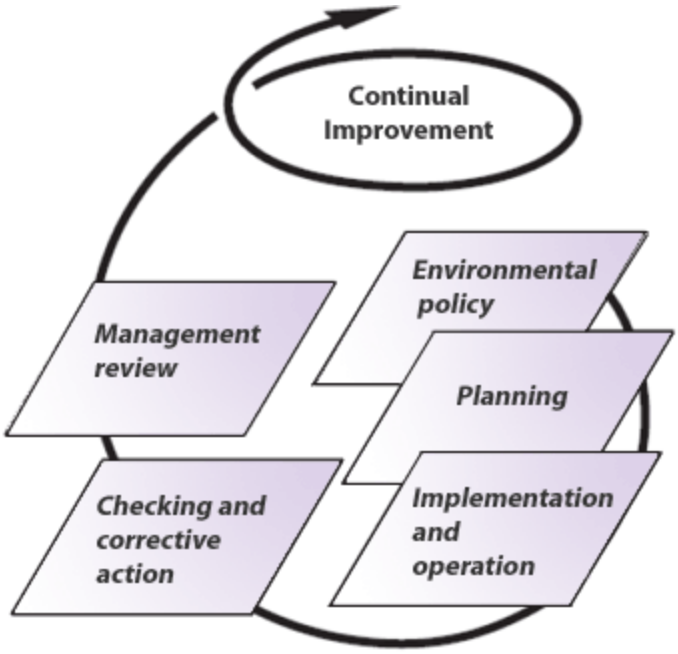

Figure 3 Continuous Improvement Scheme (International Organization for Standarization (ISO), 2004)

2.3.4 Occupational Health and Safety Management System (OHSAS 18001)

This one was published for the British Standard Institution (BSI) based on BS 8800. It was developed in 1999 to be compatible with the ISO 9001 and ISO 14001 in order to facilitate the creation of management models with basis in the three standards if desired. As in the previous standards, OHSAS 18001 does not says or stablished the performance of the organization either gives detailed specifications for the design or application of this management system.

The objective of this one is to ensure the safety in the work environment and maintain the good health of the workers throughout the minimization of risks to all the stakeholders, the implementation, maintenance and continually improvement of an occupational health and safety (OHS) management system and to stablish goals and objectives that ensure its success (Zeng, et al., 2007).

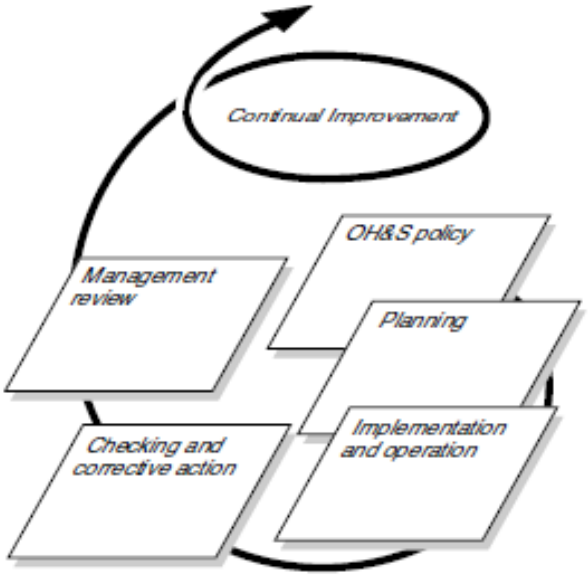

Figure 4 Continuous Improvement Scheme (British Standards Institution, 2007)

2.3.5 Integration

ISO has contributed to the integration of the management systems, they might be based in different models and elements but they state similar requirements, the standards are compatibles and the models are not contradictory (Ferguson, et al., 2002)(Jorgensen, et al., 2006)(Zeng, et al., 2007). Meanwhile the ISO14001 and OHSAS 18001 are bases on the "Plan, Do, Check; Act" principle, the ISO 9001 is based on a process-focus and system approach (Pojasek, 2006).

About how the integration and application should be done Jorgensen, et al, (2006) focused their article in there different levels of integration:

- Corresponding: which means the increase of the compatibility with the cross-references of the systems.
- Coordinated and coherent: the generation of processes with focus on tasks in the management cycle "plan-do-check-act".
- Strategic and Inherent: to create the culture of learning within the organization, the continuous improvements of the organization.

On the other hand, Bernardo, et al (2009) has elaborated from their literature review a scheme that shows the degrees of integration according to some authors, such scheme is showed in the figure 5. They also claimed that there are three types of organization, the ones that only integrated the documentation, the ones that aligned the processes, objectives and resources and finally those which integrate all parts in a single management system.

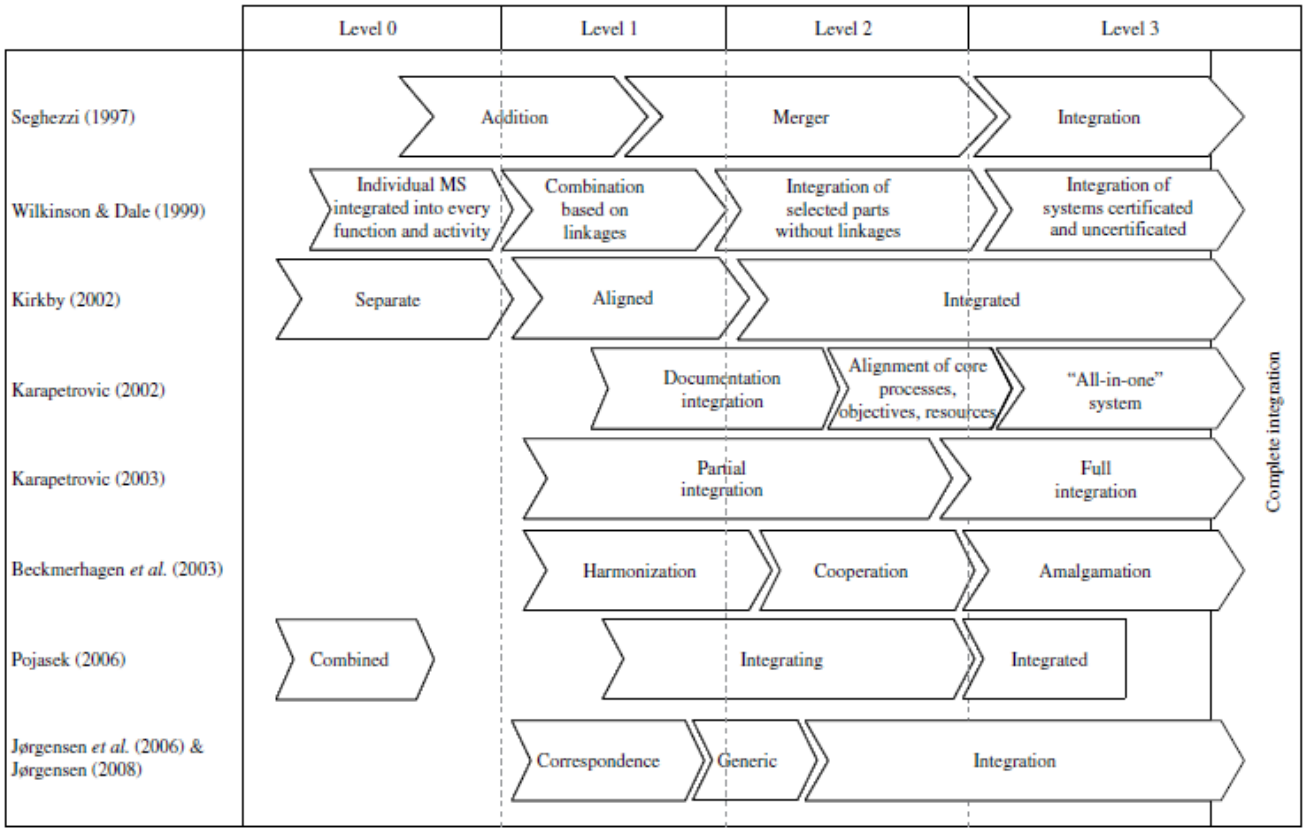

Figure 5 Degrees of Integration According to Some Authors(Bernardo, et al., 2009)

2.4. Management System in Other Competitions

The need of a management system does no only affect to the projects or organization participating in the events. Whit the same necessity for an internal structure, ISO has launched a standard for the management system of events, the ISO 20121:2012 is the Event sustainability management systems – Requirements with guidance for use developed (ISO org., 2012).

The events can also generate a lot of waste and consume in a big quantity of local resources, like water or energy. Therefore, in the pursuit of sustainability and reduce the foot print carbon induced by this kind of events, ISO along with the biggest representatives of events have created the ISO 20121 which was published on 15 Junes of 2012. It is a tool that helps with the managing of events, its related activities, products and services, in three dimension of sustainability (economic, environmental and social) offering benefits for all the stakeholders, event organizers, event owners, workforce, supply chains, participants, attendees, regulatory bodies, communities and so on (Reusch & Reusch, 2013).

It was created following the management system standards of ISO (ISO 9001, ISO14001), therefore, is a process based approach regulation with the addition of the monitoring and measuring requirements in order to reduce the use of resources and costs.

The methodology of the recent framework offers a common international language for event management, establishing the commitment to sustainability. It helps to set targets, create action plans, control and measure all the phases and ensure the continuous improvement of the system obtaining advantages and befits such as the minimization and elimination of negative environmental aspects, the increase of social and economic impacts of event, the optimization on planning and processes and maximization of the event benefits (ISO org., 2012).

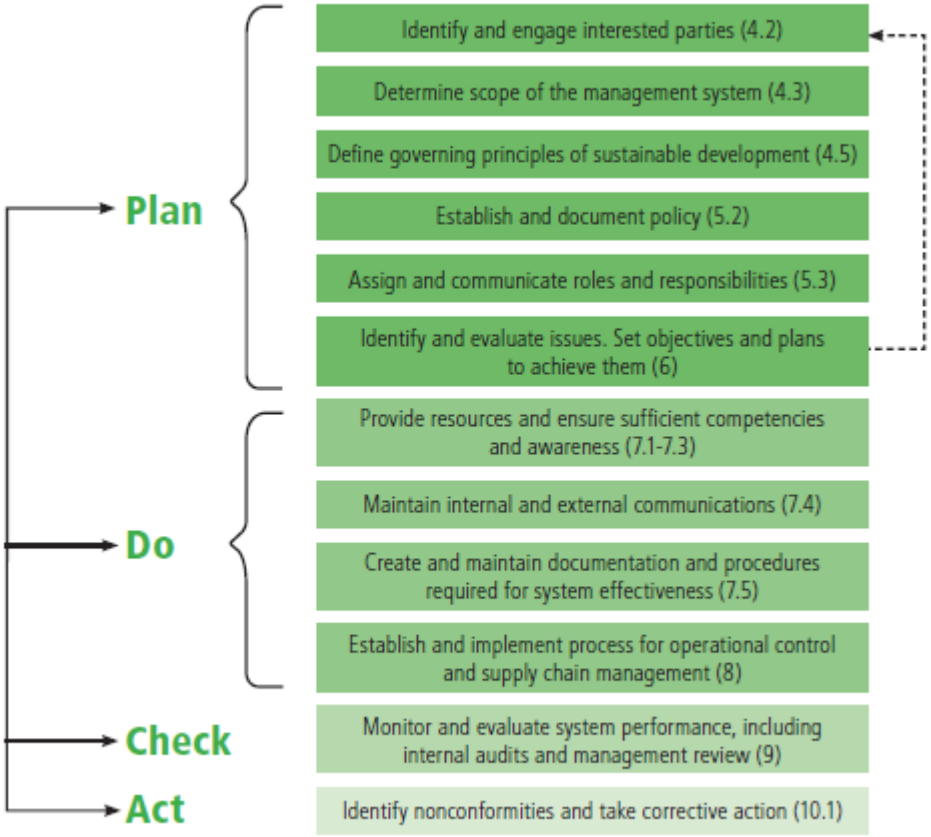

Figure 6 Plan, Do, Check, Act Approach of ISO 20121(ISO org., 2012)

The first test for this standard was its application in the 2012 Olympic and Paralympic Games celebrated in London. This is one of the biggest sport event which means the requirement of a lot of financial and human resources, energy and materials (Berlemann, 2007) and was the first event to be certified. Its application was evident in the construction of games venues, waste and carbon emission management and sustainable transport. With all the organization requirements, the establishing of processes were needed to help to develop, plan and provide a base to measure results. Some sponsors of the Olympic games and Paralympic Games, such as Coca-cola, have been also certificated and have claimed that the implementation of this standard have helped them to reach their goals and systematically integrate sustainability into all the phases of their sponsorship (Coca-Cola, 2012).

CHAPTER 3. METHODOLOGY

3.1 Survey

This paper is aimed to analyze the status of management of the projects that participated in SDE 2014. The instrument used to conduct the investigation was a questionnaire survey, this method has been deployed already by other authors in their works for similar purposes (Marret, 2000), most of the researches related to operation management and ISO standards has been conducted with this methodology because it has been accepted as a legitimate tool for a better understanding of the behavior of the company (Harjeev, et al., 2016)

The sample is composed by the 19 projects manuals published in the official web site of SDE 2014, which belongs to different teams of universities from Costa Rica, France, Spain, Unite States, Denmark, India, Japan, Italy, Romania, Germany, Switzerland, Mexico, Taiwan, Chile and Thailand.

The questions are based on the integration of the ISO standards ISO 9001:2008 Quality management systems, ISO 1400:2004 Environmental management systems and the OHSAS 18001:2007 Occupational health and safety management systems. The correspondence of these standards are posted in the last pages of the OHSAS 18001:2007 (Appendix A).The survey was designed and answered by the researcher in the basis of the public information contained in the projects manuals throughout a detailed examination of all the 19 manuals in order to measure the implementation or the lack of implementation of a model.

The content of the questionnaire is divided in 7 parts with a total of 22 questions according to the main requirements of the standards. All the questions were adapted to the content and vocabulary used in the projects and in the competition. Each item or question has only two possible answers, yes or no. The model of the questionnaire is showed in the Appendix B. The structure of the survey is describe down below:

- Part 1: General information about the teams and their projects, questions such as the name of the projects, the team and the student leader were asked in order to identify the questionnaire.
- Part 2: the second part asked about the general requirements exposed in the standards, like an integrated policy or statements, if the organization has set objectives or goals that integrate the three factors, quality, environmental and health and safety.
- Part 3: the third section contains questions related to the internal structure of the organization, the figures, roles and responsibilities of the people belonging to the team and if they have or not any internal communication plan.
- Part 4: the fourth section is composed by 2 questions about the documents, manuals or procedures of the activities carried out by the team and the recording and identification system of such documents.

- Part 5: the fifth part behold questions concerning to the control of activities that might imply any risk for the environment or the members of the team. If the organization follow those activities and if they have any risk mitigation plan or if the workers have been trained and warned about the risk and preventions in the work site.
- Part 6: this section has one single question about the existence of an emergency plan regarding health and safety, and environmental issues.
- Part 7: the seventh part contains questions regarding the review and continuous improvements of the activities done by the organization and the management system itself. If the organization does internal audits or any type of review and if they have any plan or program for correctives measures and continuous improvement.

CHAPTER 4. FUNDINGS

4.1 Survey Results

The notion of the survey is to analyze the management of the projects of SDE 2014, to achieve this gold, this one was applied to every project manual asking if they accomplice or not an specific task or process in correspondence with the standards mentioned before. The results of all the surveys are located in the Appendix C and the analysis and interpretation of the results are showed below.

As it was told before, the first part of the survey was about the general information about the project, questions such as name of the projects, name of the faculty advisor, name of the student leader and the belonging university.

The figure 7shows in percentage the answer of the second part of the survey which refers to the general requirement, it should be noted that all the teams fulfill the general requirements and rules of the contest, evinced in the sect**io**n of "Rules and Building Code Compliance Checklist" which is present in every manual.

Is also noted that the 42 % of the teams has not a policy or statement to define the organization and its participation within the competition, on the other hand, the 84% of the teams has set goals and objectives in their projects in relation with the aims of the competition. Such objectives are not fully integrated, some of the projects always misses one of the factor (quality, environmental, health and safety)

On the third part of the survey (figure 8), the one regarding the management of the team, it may be observed that almost all the teams has an structure and the figure of a project manager, sometimes is the team leader and sometimes not. Even though some of the teams has identify the functions of the members, the description of the roles and responsibilities is not present in the manual.

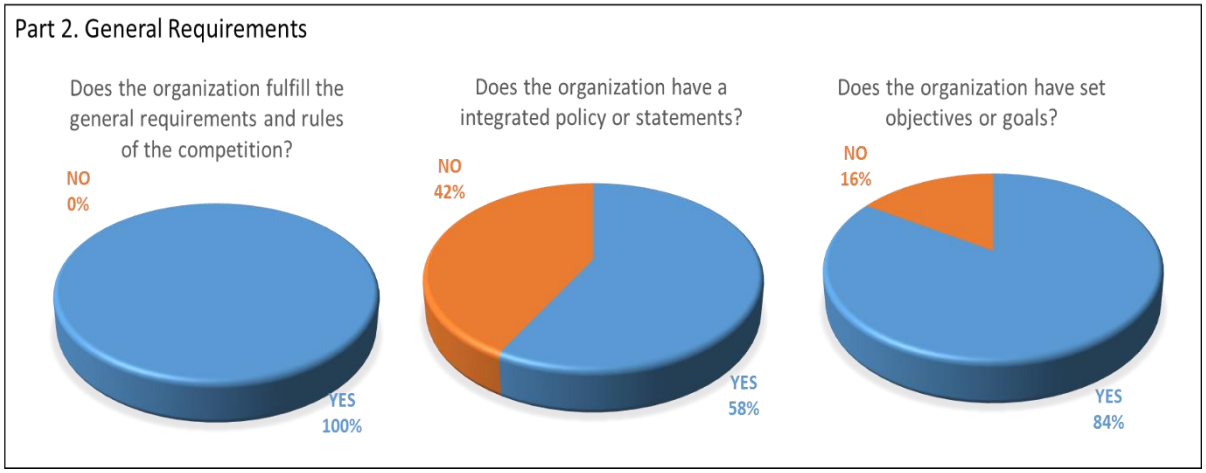

Figure 7 Results of the second part of the survey (Own Elaboration)

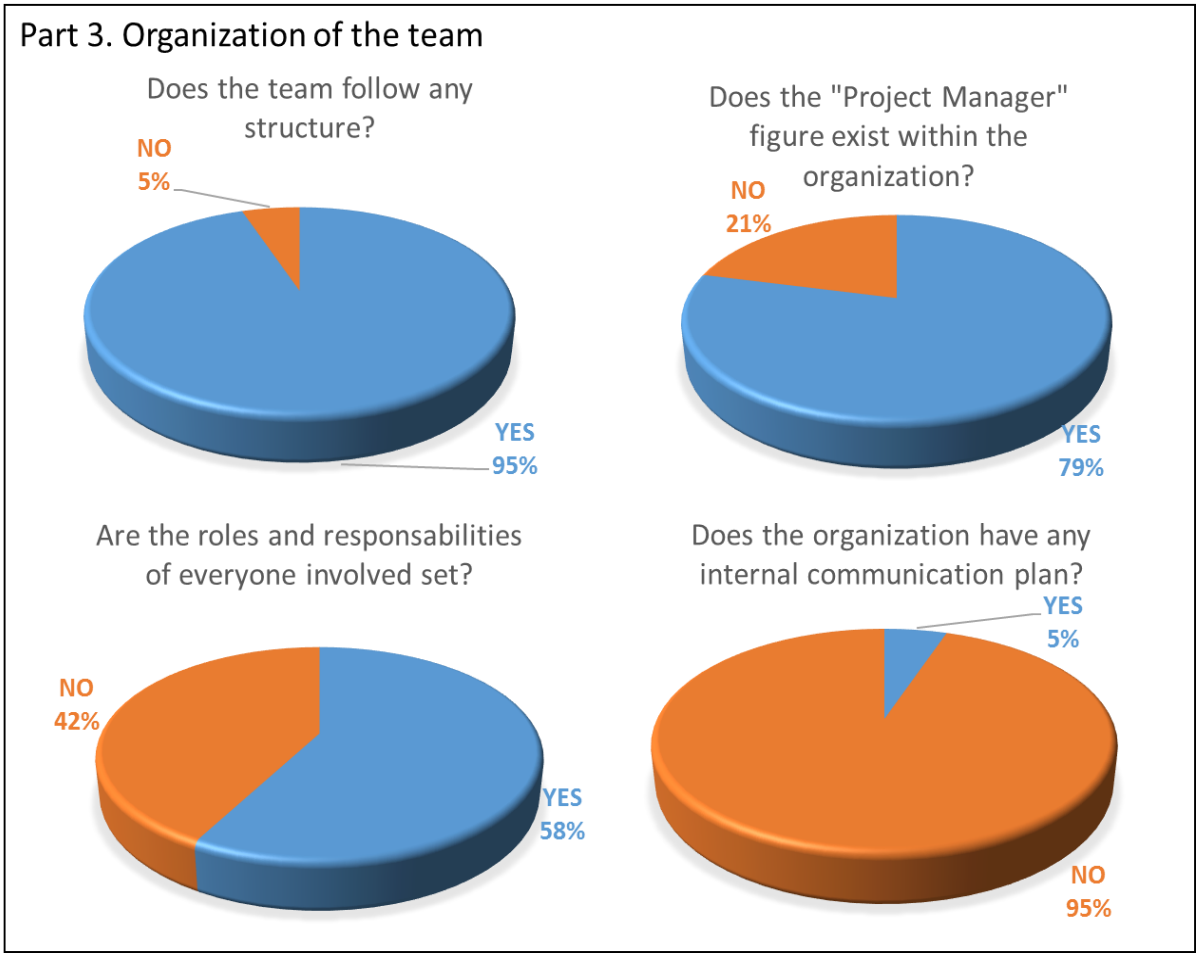

Figure 8 Results of the third part of the survey (Own Elaboration)

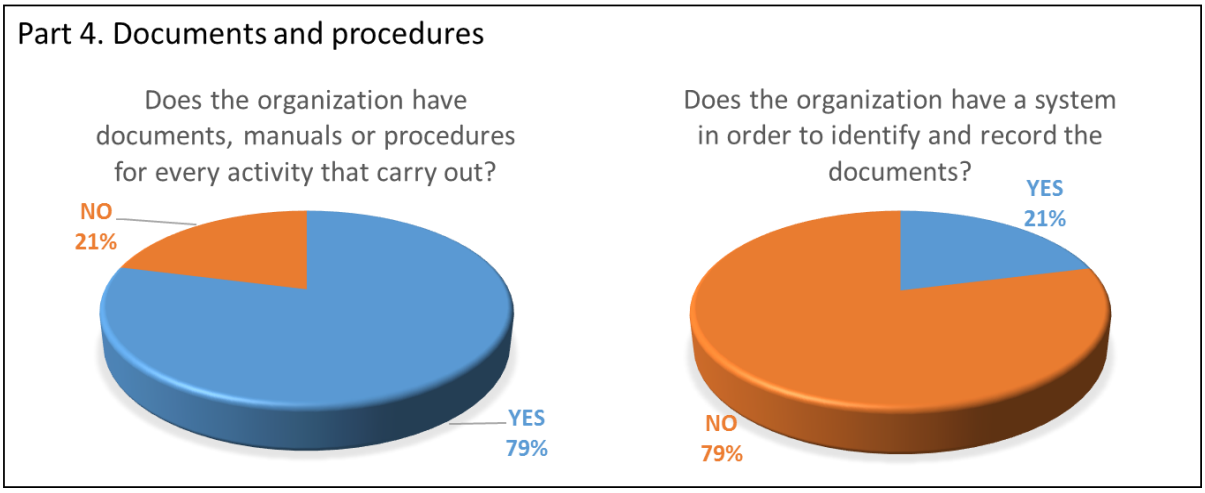

Figure 9 Results of the Fourth Part of the Survey (Own Elaboration)

One of the requirements of the SDE is to have a communication plan to make know the projects, the competition and the purpose of it to the community, sponsors and general public, in spite of that, barely the 5%, possess an internal communication plan described in the project manual which is as important as an external communication plan. When it comes to the document a procedures, the survey brought the results displayed in the figure

(figure 9). The 79 % percent of the manuals contents technical procedures regarding the assembling and disassembling of the prototype, transport procedures and instruction, emergency plans, escape routes and some other manuals. None of the documents mentioned before follow any structure, sequence or is documented, record and reviewed by the project manager.

Regarding to the control of activities assessed in the fifth part of the survey, only the 5% of the projects does not has identified and recorded the risks or has a mitigation plan, but those who has it, only makes references about health and safety risks. In spite of, the main issue of the competition is the care of the environment through the designed and construction of passive houses, any team really concerns about the environmental risks involved in their activities, or has any mitigation plan for them. Maybe the only environmental topics handled by the team is the waste management and the environmental aspects in the design of the prototype aimed to reduce the footprint.

Also the control and monitoring by the top manager of the corresponding department (health and safety and environmental department) is not present in the 74% of the manuals. The 68% of the teams that had training was about health and safety and personal security in the work as is required by the SDE organization.

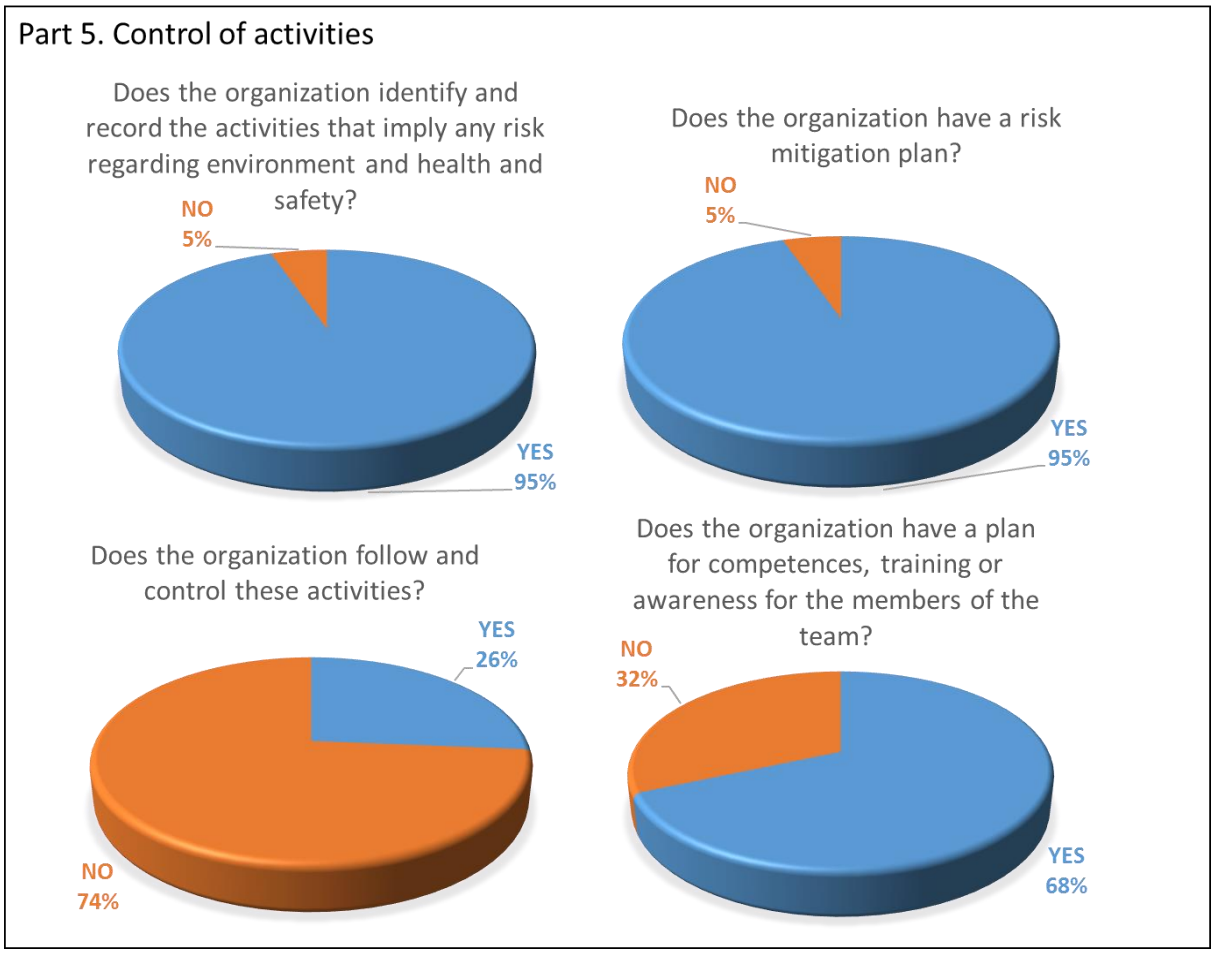

Figure 10 Results of the Fifth Part of the Survey (Own Elaboration)

The awareness about environmental risks, measure and actions about it during the execution processes were not took into account in the manuals. The same situation is observed in the emergency plans of the projects. The 95 % of the teams only considered the health and safety emergencies (figure 11).

If the organizations, or teams in this case, had reunions, internal audits or reviews done by the top manager is only reflected in a minor percentage of the manuals. Almost all the sample has not any plan or intention for their continuous improvement, although all the manuals introduce a table with all the changes and modifications that the last version of the project has had in comparison with the previous version (figure 12).

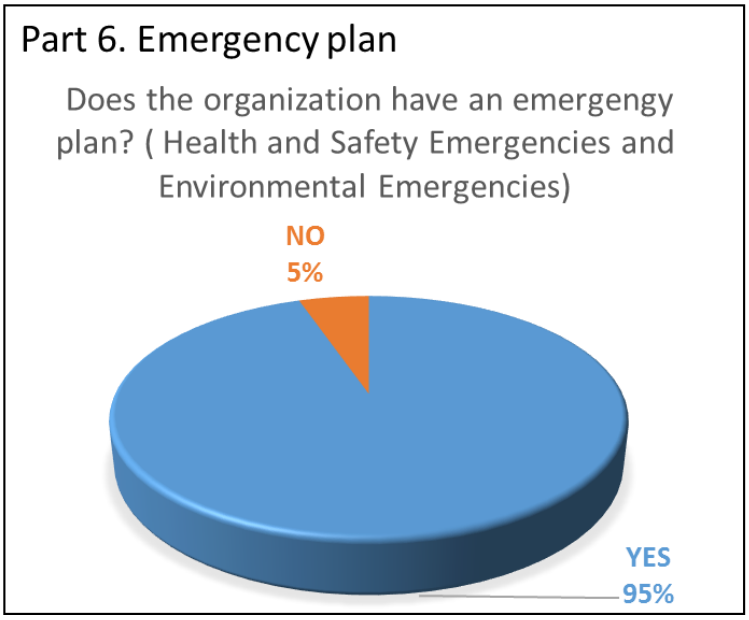

Figure 12 Results of the Sixth Part of the Survey (Own Elaboration)

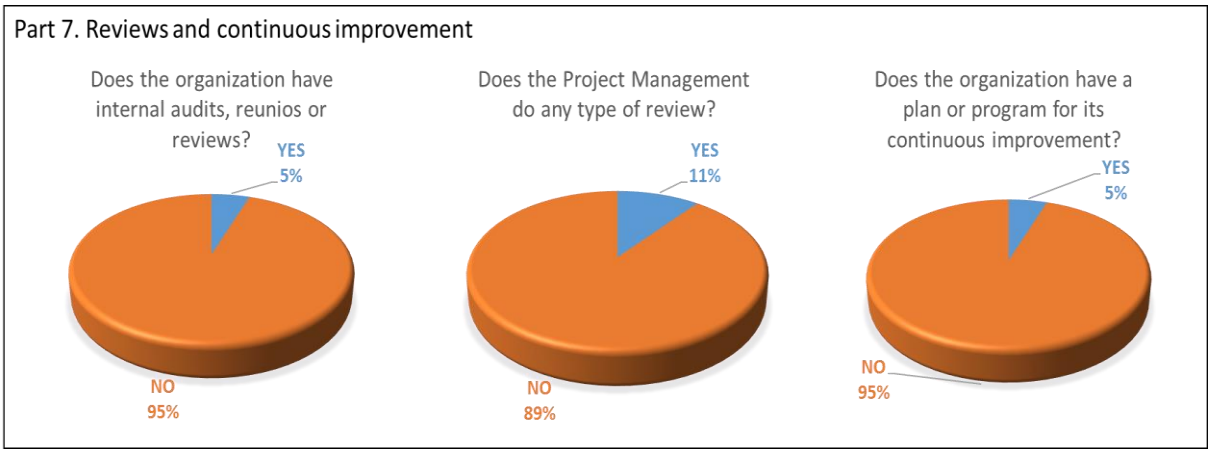

Figure 11 Results of the Seventh Part of the Survey (Own Elaboration)

4.2 Analysis and Description of the Projects

In general all the project´s manuals followed the same format suggested by the rules and specifications of the SDE organization. But for the purpose of this paper a general description of the 19 projects subjected to the survey is listed below.

- Baan Chaan: the project manual contents just at the beginning the declaration of the compromise, objectives and goals of the team, regarding the product realization according to the competition aims (quality requirement), the use of renewable energy but some OHS aspect are ignored.

  There is not information about the management of the human resources, the internal structure and communication plan or the roles and responsibilities of the members of the team.

  There are present urbanistic, electrical, engineering and architectural specifications about the design and planning of the prototype that ensure the product quality and it attachment to the rules, but, are not presented in a systematic way that facilitates the identification, record and control of them, neither subjected to a project management revision in order to guarantee the improvement of the this process.

  The employment of bamboo within the building structure, the use of a photovoltaic system, and the waste management are the only preventive environmental actions of the project, these are also the only environmental risks identify in the project manual.

  Even though the OHS issues are not considered within the objectives of the team as an organization, it is a requirement of the contest and an important issue for them, henceforth is contemplated in the project manual the identification of risky activities, and emergency plan and the training and awareness of the staff.

- CASA: The policy and objectives of the Mexican team are present in the project manual but is not integrated by the three principles studied in this paper. Within their aims is to achieve and maintain a safe environment and an efficient process during all the stages of the project, nonetheless, there is a lack of environmental policies and objectives stablished in the manual. They compromise to address the competition requirements and propose a solution for the housing issues in Mexico by regenerating a degraded ecosystem.

  They have planned the money and time resources but there is not any sign of human resources management, internal structure or communication plan and the roles of the members of the team are set but their responsibilities are no defined. There are procedures regarding emergency plans and transport in the site operation, as well as drawings and specifications about the prototype and they are codify.

  Is also present the risk identification and control of risky activities, as well as the prevention, awareness and mitigation guidelines and emergency plan, but only concerning health and safety issues. Only the waste management is taken into consideration. And, like in the majority of the projects, there is no sing of internal review.

- Efden: this project has objectives that ensure the quality of their product and include the environmental care throughout the integration of natural elements, green spaces and the use of renewable energy in order to stop negative environmental impacts induced for the construction industry, but the environmental impacts produced for their activities are ignored except for a waste disposal plan. There are also objectives sets to ensure the safe and safety during the activities of the event. They has also ensured the quality of their product and activities just by following the SDE rules and building codes.

  Event thought the roles of the stakeholder are set, they are no defined, likewise their responsibilities and their internal structure or communication plan. There are some procedures, specifications and indication, for processes and technical issues. The project contents identification, prevention and mitigation plan for safety risk, but anything regarding environmental issues except for the waste management plan suggested for the organization. Any of this activities are monitored or reviewed for any member of the organization.

- Embrace: this particular project does not have very clear objectives or goals and there is not any kind of policy. Even though the team organization does not follow any structure or has any internal communication plan all the roles and responsibilities are settled and described, especially for the site operation phase.

  There are some procedures regarding assembling and disassembling activities, drawings and specification concerning to architectural and engineering issues, as well as schedules and cost estimations, all of them counting with a system for its identification.

  As so many of the projects studied, this one has identified any activity that imply any rick for the health and safety of the workers, has created mitigation activities and emergency plan for them, but nothing concerning to environmental risk or accidents. Other important requirements that is no present in the project manual are the reunions or internal reviews done by the projects management.

- Equipe: this projects, among others, is one of the most complete regarding management system requirements. This is reflected since the very beginning of the manual when the policy or the statements of the team and its compromise with their goals and the competition. In spite of that, is not and integrated policy, some aspects are no taken into account.

  The organization does not follow any internal structure but the main figure or stakeholders are set and their responsibility is defined.

  The procedures, drawing and specifications are present in the project manual but there are any systematic way for identify and record them. Within the instructions is possible to find the waste disposal plan, but is the only environmental measure of the projects. The identification of risks, the creation of mitigation plans and emergency plans only make reference to the health and safety of the people involved in the site operations. There is not any type of review or corrective measure to assure the continuous improvement of the management system.

- H Naught: the first sign is the lack of statements of policies in the organization, the have settled objectives about the competition and their projects but nothing related with their activities and their OHS or environmental consequences.

  Even thought, the contact information of all the members of the team is a rule stablished by the SDE organizations, there is poor information about them in the manual, their roles are settled but there is not any description of their responsibilities, as well as the lack of an internal structure or communication plan.

  The procedures or instructions of the activities done during all the phases of the competition are few, there are some technical specifications and drawings but none of them are identify in a systematic way. As many of the projects, the environmental issues are not taken into consideration when identifying the activities that may represent some risk for the environment. The emergency plan and the awareness of the workers is only regarding OHS issues.

- Liv-lib: this manual is part of the percentage that does not has statements or policy, and in spite of having objectives, this ones are not integrated, this means, not all the factors (quality, environmental, health and safety) are included. The documents such as processes, procedures or instructions about the activities is poor. They have identified risk in the operation site activities and created a risk mitigation plan and emergency plan but only regarding the worker´s safety. Any of this activities has been monitored.

  Once again, there is the absence of any intention of continuous improvement, there are not previous or corrective measures.

- Maison Reciprocity: there are some general statements and objectives set by the team but there are not integrated. The figure of “Project Manager” is present in the projects and the roles are settled, as in so many others. In spite of that, the team does not follow any internal structure or communication plan.

  There are not present all the documentation that reflects the processes involved in their activities. The identification of risk that my affect the safety and health of the workers during the event is done, but there is not anything present about the environmental risk, preventions or mitigations plan, only the waste disposal plan is present as part of the competition requirements. The awareness of the workers and the emergency plan are only about OHS.

  The continuous improvements is compromised by the lack of internal reviews or corrective measures.

- OnTop: this case has not very clear which are the objectives or goals to be reached by the team in the execution of the project. It belongs to one of the projects in which there is not the figure of “project manager” and the information about the members of the team, their roles or responsibilities within the organization is not reflected in the manual. Likewise, they do not have any internal structure or communication plan.

Instructions, manuals or procedures about their activities in the event beside timetables, budgets and technical drawings, are not present in the manual and they do not follow any system in order to identify and record them.

The possible hazards to the environment are taken into account in the design and materials selected for the structure, but no during the execution of the projects with the exception of the waste disposal. The risks identified in the manual are about the OHS of the workers during the task of transportation, assembling and disassembling of the prototype and any of those activities are monitored. The awareness and competences of the team and the emergency plan are only concerning to OHS issues.

- Orchid house: This projects, as some many others, has focused their objectives and statement in addressing the requirements of the SDE competition. Some environmental and OHS aspects are not contemplated in their aims.

  In spite of having a projects manager, some issues related to the internal organization of the team are missing, such as the description of their responsibilities or their internal structure or communication plan. The documentation that record their tasks during all the phases are few in comparison with other projects, but there are some drawings and technical specifications.

  As part of the SDE Rules a solid waste management plan is done, like in all the participating projects, but is the only environmental measure considered during their activities. The risk analysis is according to the safety of the workers and the activities that may cause those ricks are monitored. Is the same situation with the risk mitigation plan and emergency plan, are only about the OHS of the workers. The project management does not execute any kind of review or audit to look for a better performance.

- Phileas: As the 100 percent of the projects the fulfillment of the rules and specifications of the SDE organization are reflected in the project manual. In this case the organization has specified some objectives and statement to be reach but is not integrated by the three aspects in which this paper is focused on.

  The roles of the members of the team is missing in the manuals, as well as the description of their responsibilities or the internal structure of the organization.

  The analysis and identification of the activities that might cause some risk are not reflected in the project as well as the awareness and emergency plan in case of occupational accidents in the operation site. But they do have a risk mitigation plan.

  The processes that guide to an improvements on the management system of this organization are no present in the project manual of this team.

- Pret- a - loger: the team from Denmark has stablished objectives and goals, they also have policy, a something that can represent the mission and vision of the organization even though is no integrated. The roles of the members of the team are set but their functions are not described, there is also the lack of an internal structure.

The only risks that were analyzed are those related to the health and safety of the workers during the activities realized in the event, as well as the mitigation and emergency plan. The waste disposal was the only environmental strategy considered by the organization because is one of the requirements of the competition.

- Renai House: this team belongs to the percentage of projects without any kind of policy or statement, in spite of that, they have set some objectives and goals according to the aims of the SDE competition but missing some aspects about the environment and the safety of the parties involved in the execution of the prototype.

  Regarding the organization structure, there are missing information about the members of the team, the project counts with a project manager but the roles and functions of the rest of the stakeholders is unknown. The same situation continues with the documents, procedures, manuals and instructions that guide the realization of their activities, even though, some drawings and technical specifications are present.

  There is also the analysis of risky activities for the well health of the workers during the phases of transport, assembling and disassembling, as well as a risk mitigation plan and an emergency plan. None of these activities are monitored and the environmental impacts or risk are not taken into account, except for the waste disposal.

- Resso: this one count with statements and objectives stablished by the organization.

  In spite of having a project manager, the organization does not follow any internal structure but all the members has a role. There are few documents or procedures describing the processes for the production and execution of the project during the event, there are also drawings for engineering and architectural specifications and they have a system in order to identify and record them.

  Resso is one of the projects that has identified, controlled and created a mitigation plan and an emergency plan for the risky situations during the construction of the prototype and the transport if the materials. One of the factors of an integrated management system in the environmental management, which is missing in this projects.

  The continuous improvement is another process within the management system that is not taken into account when reviews and correctives actions are not considered.

- Rhome: is one of the most complete manuals regarding management systems. The Italian project has stablished their own statement and objectives along the whole documents, they are no integrated but they are present.

  The team does not have the figure of project manager but the roles of the members of the team are described, there is a lack of internal structure or internal communication plan.

  The only risks considered and analyzed are those regarding the OHS of the workers. Due to that, the risk mitigation plan and the emergency plan are related to the same issues. Even though this projects has a Leed recognition, there are missing some

environmental management aspect during the execution and measurement processes involved in system.

- Symbicity House: the objectives, goals and statement of the team are present in the manual of the project, as well as the roles and responsibilities of the people involved in its execution. The content of procedures and instruction is poor if it compared with others projects, they have some technical drawings but are not identified in a systematic way.

  As it was told before, almost any of the projects have included environmental hazards in their risk analysis, the risk mitigation plan or the emergency plan. The activities that represent some danger for the workers are not monitored or reviewed, so there are no corrective measures to encourage the improvement of the organization.

- Techstyle Haus: this projects comes from 3 universities but there is not any kind of policy or statement that define their labor and compromise as an organization and their objectives only make reference to the achievements of the SDE targets and some aspects of their project.

  Some roles and responsibilities are described as in the case of the project manager and site operation coordinator. Other procedures has not someone in charge or and internal structure or communication plan. The documents that record their activities are few, they have some technical specifications and drawings.

  As in others projects, the risk analysis, the mitigation actions and the emergencies plan only make reference to hazards that may affect the safety and health of the workers during the activities in the SDE event but nothing related to environmental impact cause by them. Any of the risky activities mentioned before are monitored or controlled, as well as the rest of the process.

- Tropika: this has introduced the organization, explained their vision and mission and established the objectives to be reached with the design and execution of the project. In spite of that, there is not an integrated policy explaining their compromise and how all the objectives are going to be achieved taking into consideration the quality of the project, the safety of the parties involved and the care of the environment.

  The information about the internal structure, the functions and task of the members of the team is poor as well as the documents of the organization, such as, procedures and technical instructions. The drawings about engineering and architectural specifications are present as is mandatory.

CHAPTER 5. INTEGRATED MANAGEMENT SYSTEM ADAPTED TO THE PROJECTS PARTICIPATING IN SOLAR DECATHLON EUROPE

The second aim of this paper is to propose a model suitable to the projects participating in the SDE competition based in the gaps found in the project´s manuals of 2014, the analysis was carried out according to an integrated management system based on the ISO standards for the quality, environmental and health and safety management.

A management system is a group of elements, such as procedures, instructions, formats though which the organization plan, execute and control the activities that lead to the objectives, (Heras, et al., 2007). This guide define the organization structure and its key processes regarding quality, environmental and health and safety.

The previous literature review states that, in spite of the standards does not make reference about how to do the integration or which models or patterns has to be applied, they are based in some methodologies that might be a guide for their application (Jorgensen, et al., 2006).

In this very paper is also stated that there are two principles in which the standards are based, a process-focus and the "Plan-Do-Check-Act" strategy, so the most suitable solution is to create a system focused in processes but applying the Deming circle to each one of them in order to ensure improvement opportunities (Carmona & Rivas, 2010). This means that all the processes within the system should be planned, done, checked and improved.

Every process must be planed, designed and analyzed in order to assign capital, human resources and specific time of execution, once that is done, the plan can be carried out. During all the processes the activities must be followed, controlled and assessed, and according to the results, some corrective action should be considered in order to improve the performance.

The first step is to identify the processes involved in the project realization and then identify the link between all of them. The first ones are the processes that are implicated in the product realization (Carmona & Rivas, 2010), in this case the scheme represented in the figure 13 shows the processes needed to develop the project in order to obtain the prototype for the competition. Therefore, the design and specifications are the first processes, the production of designs, draws and other specifications of the prototype, and the activities during the event, taking into account the environment and security aspects as well as the SDE rules and objectives. With that information will be possible to proceed to do a cost estimation, to look for sponsorships and to plan the transport and site operation logistic for the event. The assembling, exhibition and dissembling of the prototype is also part of this section as well as the design of the emergency plans.

According to the analysis done before, the majority of teams does not has a policy, objectives, vision or mission that define the team, the project and their purposes and compromise. Therefore, is necessary to include to the system the processes associated to the organization management and internal planning.

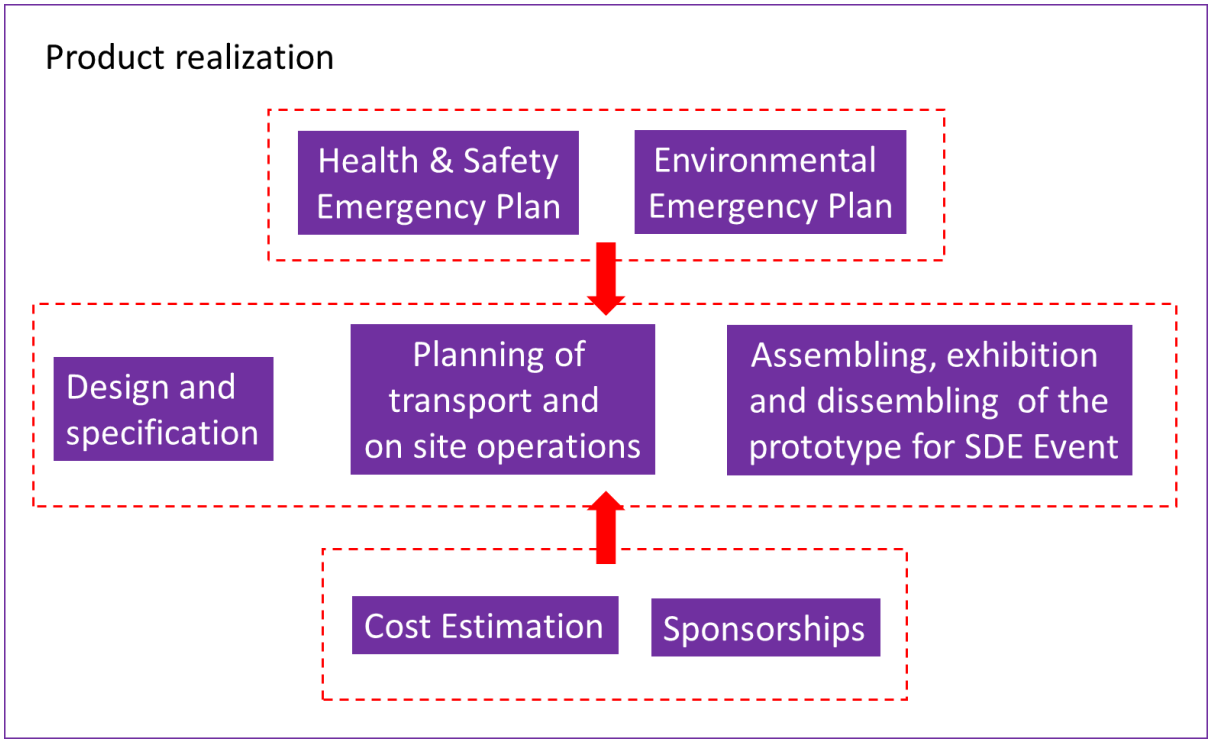

Figure 13 Processes Involved in the Product realization (Own Elaboration)

The figure14 shows that one of the processes is to set objectives and policy that define and justify the team´s actions and in which the top manager compromise to ensure the accomplishment of their policy. In this scenario is also important to take care of the SDE Building Code and Rules. As well as the creation, systematization and record of manuals, procedures and instructions. The identification and assessment of risk (environmental and health and safety), the training and awareness of the team are also part of this group of processes in order to analyze and evaluate in advance the efficiency of the system.

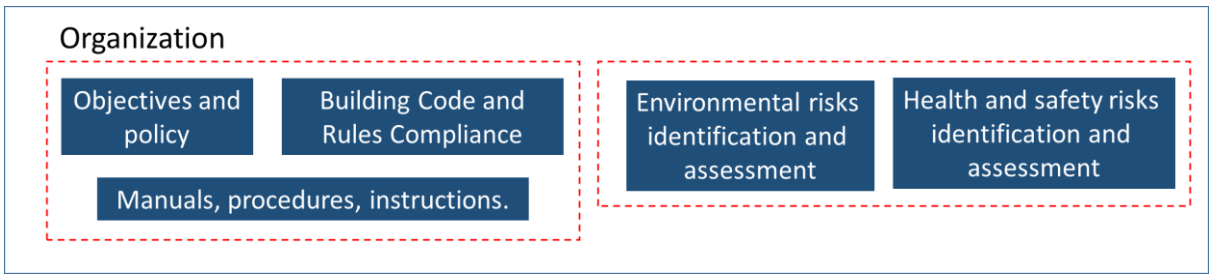

Figure 14 Organizational Processes

On the other hand, the figure 15 shows the processes associated to the resource management, the group of activities consolidated in processes that support product realization (Carmona & Rivas, 2010). For the organization of the SDE is important to know the contact information of the members of the team, but for the project manager and for a better performance it could be better to define the roles and responsibilities of all the stakeholders, the internal structure of the organization as well as to improve the internal and external communication plan. The proper managing of infrastructure, technology,

equipment, materials and other resources provided by the sponsors is needed in order to reduce the budget and give them a rational use. The management of the time and the task distribution is not only a process of the system but also a requirement in the project manual of the prototype.

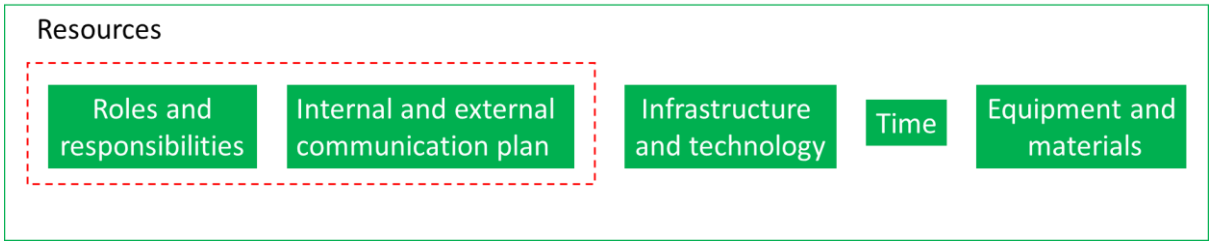

Figure 15 Processes Involved in the Management of Resources (Own Elaboration)

Finally is also necessary to include processes related to the measurement and improvement of the activities done by the team to develop the project. As it was demonstrated before, in the analysis of the project manuals, a low percentages of the projects has intention to control, measure and improve their activities and results. That is why this system aims to enhance theses aspects by including processes such as control and monitoring of the project´s quality, environmental performance and the health and safety performance as is reflected in the next figure 16.

With the assessment of the integrated performance of the system it will be possible to apply corrective and preventive actions for the continuous improvements of their activities, the idea is to reduce accidents, costs, times and increase the effectiveness of the project, this means, to accomplish the deliverables, the specifications to be evaluated (engineering, architecture, sustainability, electricity, communication and social awareness, urban design, transportation, affordability, innovation).

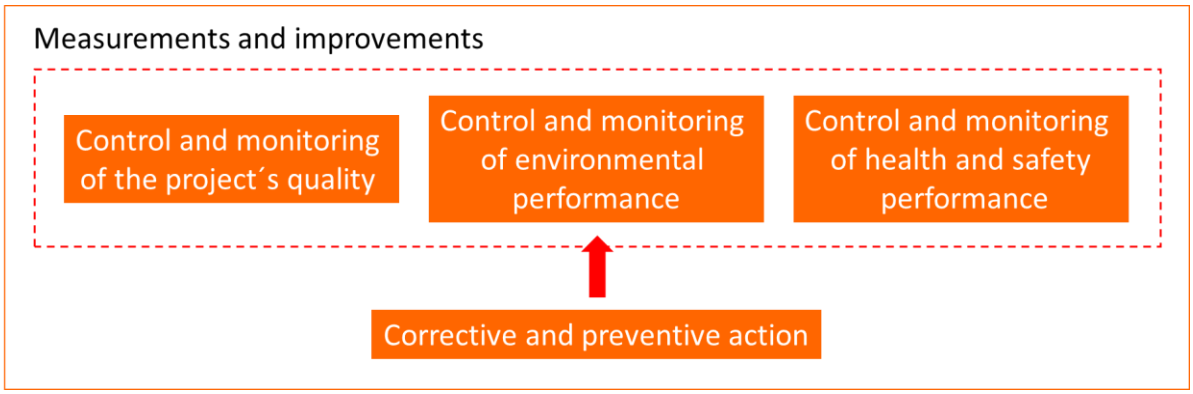

Figure 16 Processes Related to the Measurement and Improvement of the System

Once, all the processes are define is possible to find the relation between then and to shape the integrated system. It should be noted that some process are fully integrated, such as the policy and the design, and other ones are more specific like the emergency plans. As any other systems, these one has an input and an output, the first one represented by the SDE Organization and their rules, the purpose of the competition. The second one, the output, is the competition results in which all the aspects of the project are evaluated, a successful participation will be result of a good management of the project and its elements by the application of the model proposed.

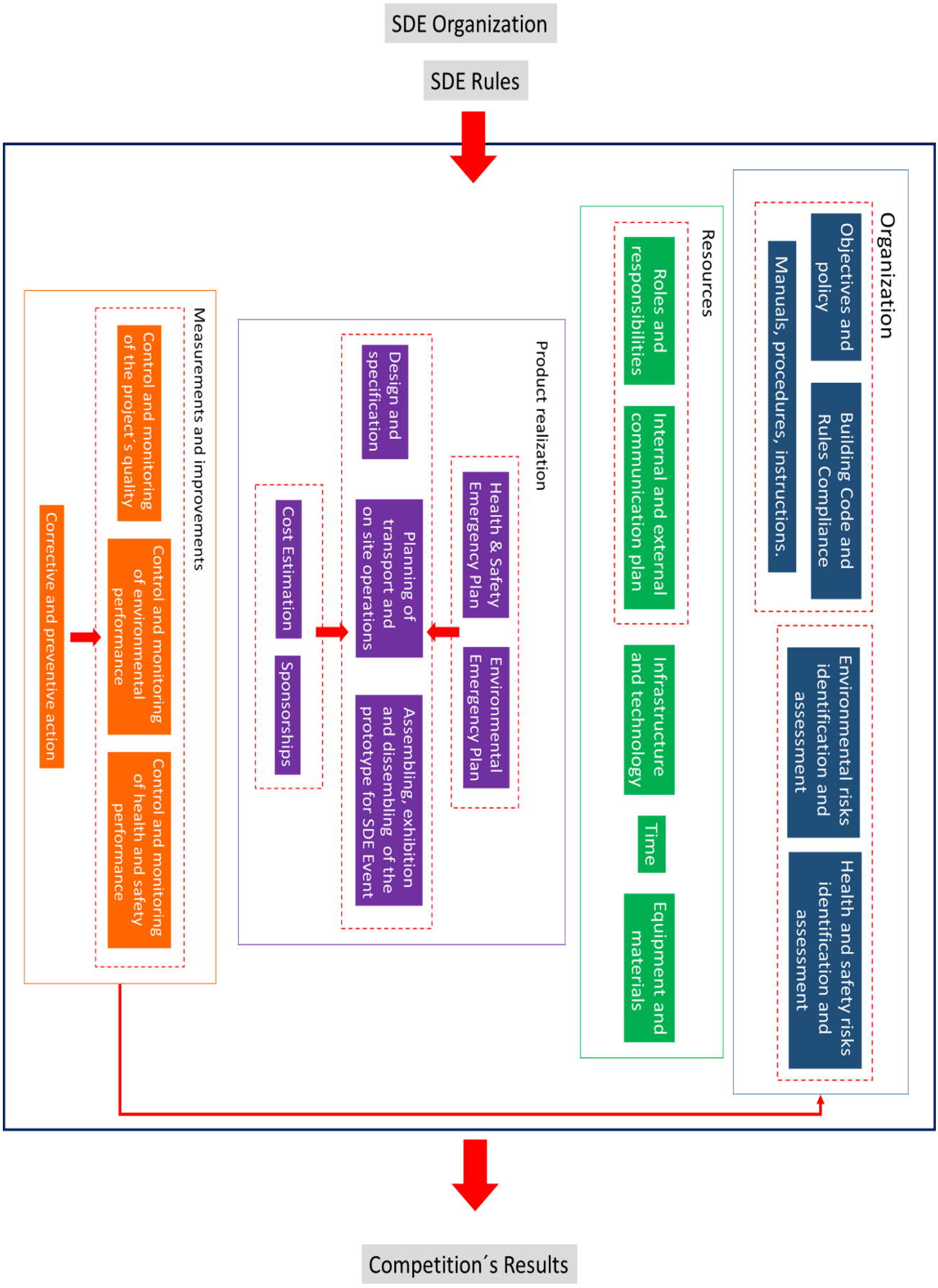

Figure 17 Integrated Management System Model Proposed for the Participating Projects in the Solar Decathlon Europe

CHAPTER 6. CONCLUSIONS

This chapter summarize the main findings and conclusions according to the objectives targeted in the beginning of the research: (1) To produce a questionnaire based on the ISO and OHSAS standards related to quality, environmental, health and safety managements management. (2) To analyze the content of the project´s manuals and identify the gaps regarding management standards, throughout the results thrown by the survey. (3) And finally, to propose a managing model for the implementation of an integrated management system for the future participants in Solar Decathlon Europe competition.

The questionnaire was the methodology throughout the analysis of 19 projects of the SDE 2014 was carried out. The survey consisted of 22 questions distributed in 7 parts, it had tow possible answers, yes or no. The questions were based on the requirements and the correspondence of all the three standards in which the study is based on. Due to a careful examination done by the researcher of the project manuals it was possible to compliment the survey.

The results are simplified in pie diagram for a better interpretation, so it was easier to detect the gaps or the lack of a managing model in the organization and execution of the projects. The first and one of the most important observations gained was the lack of an integrated policy as well as the mission and vision of the team, that means that they do not consider them self an organization. An the main goals and objectives are related to winning the competition without taking into consideration other important factor such as their compromise with the quality of their work, the care for the environment and the safety of the stakeholders involved in the project.

As consequence of that, they do not have an internal communication plan or a proper description of the internal structure of the team but the majority has the figure of project manager, in spite of that, there is no evidence in the projects or in the results of the survey, that the project manager assume any kind of compromise with the organization or the external stakeholders.

A big part of the projects analyzed has manuals and procedures for the task or processes done by them, but they do not have a system to identify or record such documents.

A great percentage identify the risks and create mitigation and emergency plans but only taking into consideration the health and safety. The environmental management and the processes to ensure the continuous improvement of the organization are the most absent factor in all the 19 projects.

Thanks to that analysis and the necessary information provided by the literature review, was possible to do the proposal of an integrated management system model adapted to the participating projects in SDE. The most suitable solution was to implement both approaches proposed for the standards, a system focused in processes in which the “Plan-Do-Check-Act” strategy must be apply, this means all the processes and task should be planed, done, checked and improved. The proposal also looks for the creation of an integrated policy to

define the teams and their objectives, which is important for them and for the external information plan.

The new model consist of linked processes regarding planning and organization, resources, product realization and measurements and improvements, based not only in the managing standards but also in the requirements, contests, guidelines and rules stablished for the SDE organization.

The main benefits of the implementation of this proposal are those named for other authors in the literature review but could be also assets in future investigations for the next editions of the competition.

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APPENDIX A: Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008.

(British Standards Institution, 2007)

Annex A (Informative) Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008

Table A.1 Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008

OHSAS 18001:2007		ISO 14001:2004		ISO 9001:2008	
—	Introduction	—	Introduction	0 0.1 0.2 0.3 0.4	Introduction General Process approach Relationship with ISO 9004 Compatibility with other management systems
1	Scope	1	Scope	1 1.1 1.2	Scope General Application
2	Normative references	2	Normative references	2	Normative reference
3	Terms and definitions	3	Terms and definitions	3	Terms and definitions
4	OH&S management system elements (title only)	4	Environmental management system requirements (title only)	4	Quality management system (title only)
4.1	General requirements	4.1	General requirements	4.1 5.5 5.5.1	General requirements Responsibility, authority and communication Responsibility and authority
4.2	OH&S policy	4.2	Environmental policy	5.1 5.3 8.5.1	Management commitment Quality policy Continual improvement
4.3	Planning (title only)	4.3	Planning (title only)	5.4	Planning (title only)
4.3.1	Hazard identification, risk assessment and determining controls	4.3.1	Environmental aspects	5.2 7.2.1 7.2.2	Customer focus Determination of requirements related to the product Review of requirements related to the product
4.3.2	Legal and other requirements	4.3.2	Legal and other requirements	5.2 7.2.1	Customer focus Determination of requirements related to the product
4.3.3	Objectives and programme(s)	4.3.3	Objectives, targets and programme(s)	5.4.1 5.4.2 8.5.1	Quality objectives Quality management system planning Continual improvement
4.4	Implementation and operation (title only)	4.4	Implementation and operation (title only)	7	Product realization (title only)

Table A.1 **Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008** *(continued)*

OHSAS 18001:2007		ISO 14001:2004		ISO 9001:2008	
4.4.1	Resources, roles, responsibility, accountability and authority	4.4.1	Resources, roles, responsibility and authority	5.1 5.5.1 5.5.2 6.1 6.3	Management commitment Responsibility and authority Management representative Provision of resources Infrastructure
4.4.2	Competence, training and awareness	4.4.2	Competence, training and awareness	6.2.1 6.2.2	(Human resources) General Competence, training and awareness
4.4.3	Communication, participation and consultation	4.4.3	Communication	5.5.3 7.2.3	Internal communication Customer communication
4.4.4	Documentation	4.4.4	Documentation	4.2.1	(Documentation requirements) General
4.4.5	Control of documents	4.4.5	Control of documents	4.2.3	Control of documents
4.4.6	Operational control	4.4.6	Operational control	7.1 7.2 7.2.1 7.2.2 7.3.1 7.3.2 7.3.3 7.3.4 7.3.5 7.3.6 7.3.7 7.4.1 7.4.2 7.4.3 7.5 7.5.1 7.5.2 7.5.5	Planning of product realization Customer-related processes Determination of requirements related to the product Review of requirements related to the product Design and development planning Design and development inputs Design and development outputs Design and development review Design and development verification Design and development validation Control of design and development changes Purchasing process Purchasing information Verification of purchased product Production and service provision Control of production and service provision Validation of processes for production and service provision Preservation of product

Table A.1 **Correspondence between OHSAS 18001:2007, ISO 14001:2004 and ISO 9001:2008** *(continued)*

OHSAS 18001:2007		ISO 14001:2004		ISO 9001:2008	
4.4.7	Emergency preparedness and response	4.4.7	Emergency preparedness and response	8.3	Control of nonconforming product
4.5	Checking (title only)	4.5	Checking (title only)	8	Measurement, analysis and improvement (title only)
4.5.1	Performance measurement and monitoring	4.5.1	Monitoring and measurement	7.6 8.1 8.2.3 8.2.4 8.4	Control of monitoring and measuring equipment (Measurement, analysis and improvement) General Monitoring and measurement of processes Monitoring and measurement of product Analysis of data
4.5.2	Evaluation of compliance	4.5.2	Evaluation of compliance	8.2.3 8.2.4	Monitoring and measurement of processes Monitoring and measurement of product
4.5.3	Incident investigation, nonconformity, corrective action and preventive action (title only)	—	—	—	—
4.5.3.1	Incident investigation	—	—	—	—
4.5.3.2	Nonconformity, corrective and preventive action	4.5.3	Nonconformity, corrective action and preventive action	8.3 8.4 8.5.2 8.5.3	Control of nonconforming product Analysis of data Corrective action Preventive action
4.5.4	Control of records	4.5.4	Control of records	4.2.4	Control of records
4.5.5	Internal audit	4.5.5	Internal audit	8.2.2	Internal audit
4.6	Management review	4.6	Management review	5.1 5.6 5.6.1 5.6.2 5.6.3 8.5.1	Management commitment Management review (title only) General Review input Review output Continual improvement

APPENDIX B: Questionnaire based on the ISO and OHSAS standard for the analysis of the projects.

Source: own elaboration.

COMPLIANCE OF REQUIREMENTS OF ISO - OHSAS STANDARDS

Management Analysis for special competitions. Case study: Solar Decathlon

*Obligatorio

PART 1: GENERAL INFORMATION ABOUT THE PROJECT

1. **NAME OF THE PROJECT:** *

   ____

2. **NAME OF THE COMPANY, UNIVERSITY, INSTITUTION** *
   Who compete

   ____

3. **FACULTY ADVISORS** *
   Name and surname

   ____

4. **STUDENT LEADERS** *
   Name and surname

   ____

PART 2: General requirements

5. **2.1. Does the organization fulfill the general requirements and rules of the competition?** *
   Marca solo un óvalo.

   ( ) YES
   ( ) NO
   ( ) Otro: ________________________

6. 2.2. Does the organization have a Integrated policy or statements? *
Marca solo un óvalo.

- YES
- NO
- Otro: _____

7. **2.3. Does the organization have set objectives or goals?** *
Marca solo un óvalo.

- YES
- NO
- Otro: _____

8. **COMMENTS**

_____

_____

_____

_____

_____

In relation to 4.1,5.5, ISO 9001:2008 - 4.1 ISO14001:2004 - 4.1 OHSAS 18001:2007

PART 3: Organization of the team

9. **3.1. Does the team follow any structure?**
Marca solo un óvalo.

- YES
- NO
- Otro: _____

10. **3.2. Does the "Project Manager" figure exist within the organization?**
Marca solo un óvalo.

- YES
- NO
- Otro: _____

11. 3.3. Are the roles and responsabilities of everyone involved set?
Marca solo un óvalo.

- YES
- NO
- Otro: _____

12. **3.4. Does the organization have any internal communication plan?**
Marca solo un óvalo.

- YES
- NO
- Otro: _____

13. **COMMENTS**

_____

_____

_____

_____

_____

In relation to 5.1, 6.1, 6.3, 5.5 ISO 9001:2008 - 4.4.1, 4.4.3 SO14001:2004 - 4.4.1, 4.4.3OHSAS 18001:2007

PART 4 : Documents and procedures

14. **4.1. Does the organization have documents, manuals or procedures for every activity that carry out?**
Marca solo un óvalo.

- YES
- NO
- Otro: _____

15. **4.2. Does the organization have a system in order to identify and record the documents?**
Marca solo un óvalo.

- YES
- NO
- Otro: _____

16. COMMENTS

In relation to 7.1, 7.2, 7.3, 7.4, 7.5, ISO 9001:2008 - 4.4.5, 4.4.6 SO14001:2004 - 4.4.5, 4.4.6 OHSAS 18001:2007

PART 5: Control of activities

17. 5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?
Marca solo un óvalo.

- YES
- NO
- Otro: _____

18. 5.2. Does the organization follow and control these activities?
Marca solo un óvalo.

- YES
- NO
- Otro: _____

19. 5.3. Does the organization have a risk mitigation plan?
Marca solo un óvalo.

- YES
- NO
- Otro: _____

20. 5.4. Does the organization have a plan for competences, training or awareness for the members of the team?
Marca solo un óvalo.

- YES
- NO
- Otro: _____

21. **COMMENTS**

In relation to 6.2, 7.6, 8.1, 8.2, 8.4, ISO 9001:2008 - 4.4.2, 4.4.6, 4.5.1 SO14001:2004 - 4.4.2, 4.4.6, 4.5.1 OHSAS 18001:2007

PART 6: Emergency Plan

22. **6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)**

Marca solo un óvalo.

- YES
- NO
- Otro: _____

23. **COMMENTS**

In relation to 8.3 ISO 9001:2008 - 4.4.7 SO14001:2004 - 4.4.7 OHSAS 18001:2007

PART 7: Review and Continuous Improvements

24. **7.1. Does the organization have internal audits, reunios or reviews?**

Marca solo un óvalo.

- YES
- NO
- Otro: _____

25. **7.2. Does the Project Management do any type of review?**
Marca solo un óvalo.

- YES
- NO
- Otro: ______________________

26. **7.3. Does the organization have a plan or program for its continuous improvement?**
Marca solo un óvalo.

- YES
- NO
- Otro: ______________________

27. **COMMENTS**

____
____
____
____
____

In relation to 8.2.3, 8.2.4, 8.2.2, 5.1, 5.6, 8.5.1 ISO 9001:2008 - 4.5.2, 4.5.5, 4.6 SO14001:2004 - In relation to 8.3 ISO 9001:2008 - 4.4.7 SO14001:2004 - 4.4.7 OHSAS 18001:2007 OHSAS 18001:2007

APPENDIX C: Summary of questionnaire responses.

Source: own elaboration.

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Baan Chaan	CASA	EFdeN
1.2 Name of the University	King Mongkut´s University of Technology	Universidad Nacional Autónoma de México	University of Cucharest
1.3 Faculty Advisor	Weeraphan Shinawatra	H. Carrasco, V. Borja, R. Bolaños	Marci Zina
1.4 Student Leader	Woraphon Leelasathaponkit	Jorge Tenorio, Santiago Mota	Ene Andrei
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	YES	YES	YES
2.3. Does the organization have set objectives or goals?	YES	YES	YES
COMENTS	The health and safety factors are missing in the policy and objectives.	They only compromise to accomplihs the requierement of the SDE and to solve a sustainable housing in Mexico City.	Non integrated policy.
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	YES	YES	YES
3.3. Are the roles and responsabilities of everyone involved set?	NO	YES	YES
3.4. Does the organization have any internal communication plan?	NO	NO	NO

COMENTS	Poor information about the responsabilities of teams members and their internal structre or communication plan.	The roles of the menbers are	Do not follow any structure or internal communication plan. The description or the responsibilities is not reflected in the manual.
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	YES	YES
4.2. Does the organization have a system in order to identify and record the documents?	NO	YES	YES
COMENTS	There are some technical specifications but no procedures about their activities.		They have manual and procedures identify in the project manual but some of them are not present in it.
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	YES	YES
5.2. Does the organization follow and control these activities?	NO	YES	NO
5.3. Does the organization have a risk mitigation plan?	YES	YES	YES
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	NO	YES	YES
COMENTS	Risk activities and risk mitigation plan only regardind health and safety issues.	But only about heatlh and safety aspects.	Only regarding heatlh and safety issues. There are not any register of the following of risky activities.
PART 6. EMERGENCY PLAN			

6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	YES	YES
COMENTS	Only about Health and safety emergency plan.	Only about Health and safety emergency plan.	Only about Health and safety emergency plan.
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	NO
7.2. Does the Project Management do any type of review?	NO	NO	YES
7.3. Does the organization have a plan or program for its continuous improvement?	NO	NO	NO
COMENTS	No sign of any kind of reviw of the project	No sign of any kind of reviw of the project	

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Embrace	Equipe	H Naught
1.2 Name of the University	DTU Delft University	VIA - UJI	ITT Bombay and Rachana Sansad Trust's Academy of Architecture
1.3 Faculty Advisor	Christina Ronne	Teresa Gallego and Poul Borison	Rangan Banerjee
1.4 Student Leader	Ulrik Egger Knuth-Winterfeldt		Jean-Élie Tanguy
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	NO	YES	NO
2.3. Does the organization have set objectives or goals?	NO	YES	NO
COMENTS	They do not have policy, statements, objectives or goals as organization.	The organization has policy and statements but in none of them they compromise to take care of the environment or the safety of the team during the execution of the project.	They have a philosophy and statement but they are not estructured or has anything related with their activities.
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	YES	YES	YES
3.3. Are the roles and responsabilities of everyone involved set?	YES	YES	YES

3.4. Does the organization have any internal communication plan?	NO	NO	NO
COMENTS	The internal communication plan is not reflected in the project manual. And does not follow any structure.	The Iinternal organization organization of the team and the internal communication plan are not reflected in the project manual.The Studen Leader is the figure of project management in the competition.	Poor information about the members of the team.
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	YES	NO
4.2. Does the organization have a system in order to identify and record the documents?	YES	NO	NO
COMENTS	Any of these characteristics are present in the project manual	The team has some procedures but not all of them. They do not have a system to record or identify any document.	
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	YES	YES
5.2. Does the organization follow and control these activities?	NO	YES	YES
5.3. Does the organization have a risk mitigation plan?	YES	YES	YES

5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	NO	YES	YES
COMENTS	But only regarding Health and Safety issues	The team has identified the risk but only those regarding health and safety, as well as the mitigation plan.	But only regarding Health and Safety issues
PART 6. EMERGENCY PLAN			
6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	YES	YES
COMENTS	But only regarding Health and Safety Emergencies	But only concern to Health and safety	But nothing related to environmental issues
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	NO
7.2. Does the Project Management do any type of review?	NO	YES	NO
7.3. Does the organization have a plan or program for its continuous improvement?	NO	YES	NO
COMENTS	Any of these activities are reflected in the project manual		

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Liv-lib´	Maison Reciprocity	Ontop
1.2 Name of the University	Paris EST	Appalachian State University	University of Applied Sciences Frankfurt
1.3 Faculty Advisor	Mauricio Brocalo	Jaiime Russell	Sebastian Flader/Hans Jurgen Schmitz
1.4 Student Leader	Jean-Élie Tanguy	William Pfieger / Daphne Carriere	Karim Ayoub
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	NO	YES	YES
2.3. Does the organization have set objectives or goals?	YES	YES	NO
COMENTS	No integrated objectives	Very General	
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	YES	YES	NO
3.3. Are the roles and responsabilities of everyone involved set?	YES	NO	NO
3.4. Does the organization have any internal communication plan?	NO	NO	NO
COMENTS		There are not description of resopnsabilities	
PART 4. DOCUMENTS AND PROCEDURES			

4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	NO	NO
4.2. Does the organization have a system in order to identify and record the documents?	NO	NO	NO
COMENTS		There are not all the manuals regarding all the activities donde by the team	
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	YES	YES
5.2. Does the organization follow and control these activities?	NO	NO	NO
5.3. Does the organization have a risk mitigation plan?	YES	YES	YES
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	YES	YES	NO
COMENTS		Emergency plan only regarding health ans safety issues	
PART 6. EMERGENCY PLAN			
6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	YES	YES
COMENTS		But only concerning health and safety	
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	NO

7.2. Does the Project Management do any type of review?	NO	NO	NO
7.3. Does the organization have a plan or program for its continuous improvement?	NO	NO	NO
COMENTS			

4-Jan

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Orchid House	Phileas	Pret-a-Loger
1.2 Name of the University	Nation Chiao Tung University		Delft University of Technology
1.3 Faculty Advisor	David Tseng	Bettina Horsch	Andy van den Dobbelsteen
1.4 Student Leader	Sheng-Kal sky Tseng	Marlon Huchet	Petar Zhivkov
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	YES	YES	NO
2.3. Does the organization have set objectives or goals?	YES	YES	YES
COMENTS	The aims or objectives are only related to the result of the project.		They have a policy, objectives, mission and vision but not in a structured way. No compromise or statements sign by the project management
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	YES	YES	YES
3.3. Are the roles and responsabilities of everyone involved set?	YES	NO	NO
3.4. Does the organization have any internal communication plan?	NO	NO	NO

COMENTS	There is no any description of responsabilities.		The roles are determined but their responsibilities or functions are not described. They have Project manager and quality manager.
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	NO	NO
4.2. Does the organization have a system in order to identify and record the documents?	NO	NO	NO
COMENTS	There are not procedures for all the operations or activities developed for the team.		There are no manuals or procedures for all the activities developed by the team.
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	NO	YES
5.2. Does the organization follow and control these activities?	YES	NO	NO
5.3. Does the organization have a risk mitigation plan?	YES	YES	YES
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	YES	NO	NO

COMENTS	Nothing related to environmental issues		But only regarding health and safety They have control of the risky activities
PART 6. EMERGENCY PLAN			
6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	NO	YES
COMENTS	But only regarding health and safety emergencies.		But not about environmental emergency
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	YES
7.2. Does the Project Management do any type of review?	NO	NO	NO
7.3. Does the organization have a plan or program for its continuous improvement?	NO	NO	NO
COMENTS			Control and monitoring of its activities Quality Manager. Core-team Meetings and presentations

5-Jan

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Renai House	Resso	Rhome
1.2 Name of the University	Chiba University Japan	Universidad Politécnica de Catalunya	University Roma TRE
1.3 Faculty Advisor	Takaharu Kawase		Chiara Tonelli
1.4 Student Leader	Shota Tajima		Michele Caltabiano
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	NO	YES	NO
2.3. Does the organization have set objectives or goals?	YES	YES	YES
COMENTS	The policy, objectives or goals are not reflected in the project manual.		The policy and the objectives are not integrated in one document but there are include along the project.
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	YES	YES	NO
3.3. Are the roles and responsabilities of everyone involved set?	NO	YES	YES
3.4. Does the organization have any internal communication plan?	NO	NO	NO

COMENTS			The structure, internal organization, description of responsibilities and the internal communication plan are not included in the project.
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	NO	YES
4.2. Does the organization have a system in order to identify and record the documents?	NO	YES	NO
COMENTS	there are no manuals or procedures for any of the activities done by the team.		This project has procedure for almost all the activities and they are codified.
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	YES	YES
5.2. Does the organization follow and control these activities?	NO	YES	NO
5.3. Does the organization have a risk mitigation plan?	YES	YES	YES
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	YES	YES	YES
COMENTS	Only regarding health and safety measures.	Only regarding health and safety measures.	Only regarding health and safety measures.
PART 6. EMERGENCY PLAN			

6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	YES	YES
COMENTS	Nothing about Environmental emergencies.		The emergency plan regarding environmental issues is missing in the project.
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	NO
7.2. Does the Project Management do any type of review?	NO	NO	NO
7.3. Does the organization have a plan or program for its continuous improvement?	NO	NO	NO
COMENTS	Any of theses activities is reflected in the project manual		Any of the activities named are reflected in the project.

6-Jan

P+A287:D310ART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Symbcity House	Techstyle Haus	Tropika
1.2 Name of the University	Universidad de Alcalá	Brown University, Rhode Island School of Design, University of Applied Sciences in Erfurt	Costa Rica Institute of Technology
1.3 Faculty Advisor	Francisco Castilla	Ryan Abandroch and Christopher Bull	Juan Carlos Martí
1.4 Student Leader	Eduardo Pérez	Jacquelyn Albano	
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES	YES	YES
2.2. Does the organization have a integrated policy or statements?	YES	NO	NO
2.3. Does the organization have set objectives or goals?	YES	YES	YES
COMENTS	Not in an structural way		They have mission and vision as an organization! They introduce and present the
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	YES	NO	NO
3.2. Does the "Project Manager" figure exist within the organization?	NO	YES	YES
3.3. Are the roles and responsabilities of everyone involved set?	YES	YES	NO
3.4. Does the organization have any internal communication plan?	NO	NO	NO
COMENTS			Poor information about the members of the team.
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	NO	NO	NO

4.2. Does the organization have a system in order to identify and record the documents?	NO	NO	NO
COMENTS			Not all the activities done bu the team have procedures or manuals
PART 5. CONTROL OF AVTIVITES			
5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES	YES	YES
5.2. Does the organization follow and control these activities?	NO	NO	NO
5.3. Does the organization have a risk mitigation plan?	YES	YES	NO
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	YES	YES	NO
COMENTS			
PART 6. EMERGENCY PLAN			
6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES	YES	YES
COMENTS			In not very detailed
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO	NO	NO
7.2. Does the Project Management do any type of review?	NO	NO	NO
7.3. Does the organization have a plan or program for its continuous improvement?	NO	NO	NO
COMENTS			

7-Jan

PART 1. GENERAL INFORMATION ABOUT THE PROJECT			
1.1 Name of the Project	Your +		
1.2 Name of the University	Luceme of Applied Sciences and Art		
1.3 Faculty Advisor	Hanspeter Burgi		
1.4 Student Leader	Simon Gallner		
PART 2. GENERAL REQUIEREMENTS			
2.1. Does the organization fulfill the general requirements and rules of the competition?	YES		
2.2. Does the organization have a integrated policy or statements?	YES		
2.3. Does the organization have set objectives or goals?	YES		
COMENTS			
PART 3. ORGANIZATION OF THE TEAM			
3.1. Does the team follow any structure?	NO		
3.2. Does the "Project Manager" figure exist within the organization?	NO		
3.3. Are the roles and responsabilities of everyone involved set?	NO		
3.4. Does the organization have any internal communication plan?	NO		
COMENTS			
PART 4. DOCUMENTS AND PROCEDURES			
4.1. Does the organization have documents, manuals or procedures for every activity that carry out?	YES		
4.2. Does the organization have a system in order to identify and record the documents?	NO		
COMENTS			
PART 5. CONTROL OF AVTIVITES			

5.1. Does the organization identify and record the activities that imply any risk regarding environment and health and safety?	YES		
5.2. Does the organization follow and control these activities?	NO		
5.3. Does the organization have a risk mitigation plan?	YES		
5.4. Does the organization have a plan for competences, training or awareness for the members of the team?	YES		
COMENTS			
PART 6. EMERGENCY PLAN			
6.1. Does the organization have an emergengy plan? (Health and Safety Emergencies and Environmental Emergencies)	YES		
COMENTS			
PART 7. REVIEW AND CONTINUOUS IMPROVEMENTS			
7.1. Does the organization have internal audits, reunios or reviews?	NO		
7.2. Does the Project Management do any type of review?	NO		
7.3. Does the organization have a plan or program for its continuous improvement?	NO		
COMENTS			