The role of VGI to develop the new Surveyor in Europe

Edgar Barreira, Gonçalo Maia, Hugo Silva, Inês Vilas Boas, Rui Nunes, Lisbeth Marques, André Sá
{edgar.barreira@gmail.com, goncalomaia2009@gmail.com, hdsilva@gmail.com,
vilasboas.inesj@gmail.com, rui.nunes1985@gmail.com, lisbethchristina@gmail.com,
andregvsa@gmail.com}

Abstract

From the past until modern times, the Surveyor has developed his skills, from the measurements until the data modelling. When the Internet started its history (1950), the Surveyor had a crucial role on the field, producing cartography and cadaster projects, developing the first great photogrammetric projects. Since the 60's, the Internet, the field equipments and GIS, have transformed the way a Surveyor must apply his learned skills.

Actually the surveying equipments are more modern than ever, with less skills being needed. Ten years ago the Internet have turned into a new era, called Web 2.0, but actually some authors believe we are experienced the third Era of the Internet, following "The Collaborative Economy" concept. We live the "Internet of Things", where the smallest object can use Internet to communicate and to be monitored. The European Surveyor must adjust the knowledge to this new Era of communication, to survive and to encourage a new generation of professionals. Despite the new opportunities to apply the learned skills outside of Europe, in the emerging markets, for instance, the Surveyor needs to evolve and to follow the new trends, leading with the free market rules. A lot of professional groups are looking at Geo-information to get new opportunities, after decades of work made by the Surveyors. The European Surveyor lives an historic moment: either do, or die. The Young Surveyors Network (YSN) was created to fight against this "announced death". The Portuguese local chapter of YSN (called YSN-Pt) wants to contribute to update the credibility of the profession, developing some projects around Volunteered Geographic Information (VGI). This new trend follows the concept of "The Collaborative Economy": the new challenge is the development of

new business models. This article represents the YSN-Pt proposal to renew the role of the Surveyor in Portugal and Europe.

1. Introduction

The Surveyor profession was recognized in Portugal when Carlos Viegas Gago Coutinho, a Portuguese Navy's Admiral, first acknowledges the importance of this highly specialized professional. His definition of a Surveyor was similar to the one which exists today: "The Surveyor is primarily a specialist in the field of positioning, his best technical quality is knowing where we are with infinitesimal precision."

In Portugal, most of the society don't knows the role of the Surveyor, thus resulting in the need for the Geographical Engineering College of the Portuguese Engineers Association (OE-EG) to support YSN-Pt. The setup team members were participants in the "V International Training Course in Topography for Young Surveyors" and organizers of the First FIG Young Surveyors European Meeting. YSN-Pt considers the participation in the international events promoted by CLGE and FIG, to exchange experiences, expose the Portuguese work, acquire new ideas with another young and senior professionals, all this in order to bring motivation to the Portuguese Young Surveyors and students.

With this article the YSN-Pt would like to have the opportunity to discuss the Portuguese strategies with the existing groups within FIG and CLGE. For this article, YSN-Pt identifies what is the proposed strategy to answer the next issues published by CLGE:

- **Subject 1 (S1):** How could CLGE motivate young surveyors to be more active and/or more engaged in the association (national and/or international levels);
- **Subject 2 (S2):** How could CLGE act to give an increased added value to its members, especially young members or potential members of the national associations;
- **Subject 3 (S3):** What could CLGE do to motivate youngsters to choose the studies of Surveying and to enter the surveying profession (in countries suffering of a lack of young surveyors);

Address Offices in Brussels : Rue du Nord 76, BE – 1000 Bruxelles. Tel +32/2/217.39.72 Fax +32/2/219.31.47
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2. Why Portugal is so particular?

How can such a small country be responsible for the first approach to the "first global village"? Well, what we all know has given grave concern the knowledge of our planet, and in many cases, part of the countries culture, lifestyle and language, is most due to a bunch of fearless people, from this southwestern extremity of Europe, exploring the seas: first Europeans to reach the far east Asia, but even more important were their relations with some African and American natives. They were responsible for the first global commercial trade.

Martin Page, a British journalist, once wrote: "*Portugal is Europe's southwestern extremity, washed by the Atlantic, and warmed by the Mediterranean sun. Alone among Iberia's ancient kingdoms, in it's independence from Spain, it is a nation about half the size of Florida, with two-thirds the population. Yet over centuries, it has influenced the lives of the rest of us far more than many much larger and more powerful countries. The Portuguese gave the English afternoon tea, and Bombay, the key to empire. They brought to Africa protection from malaria, and slave-shipments to America; to India, higher education, curry and samosas; to Japan, tempura and firearms.*"

Due to all economic and cultural exchanges around the World throughout centuries, the Portuguese language is the 7th most spoken language among the existent 6000. Portugal is the main part of CPLP, a community of Portuguese speakers countries with privileged relations between them. CPLP countries are: Angola, Brazil, Cape Verde, Guinea-Bissau, Equatorial Guinea, Mozambique, East Timor, Sao Tome and Principe and, of course, Portugal.

As referred above, Gago Coutinho best known for the first aerial crossing of the South Atlantic in 1922, also calculated the equator line in São Tome and Principe through astronomical observations. The Portuguese Surveyors were responsible for all the cartography of Timor, Congo, Zambezi and Niassa, establishment of the Angola-Zaire border and many of these countries geodetic networks. Nowadays, the capabilities of Portuguese Surveyors and Engineers in these countries are highly request and recognized. At the same time, hundreds of protocols between

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educational institutions and companies along all the community, became a bridge of new opportunities in the field of economy and education.

On the other hand the Iberian Peninsula allows the interaction between Ibero-American countries. ASIBEI (Asociación Iberoamericana de Instituciones de Enseñanza de la Ingeniería) is the organization which promotes the debate of the education of the Engineering through Portugal, Spain and another ones in the South America and Caribbean regions. The role of the Surveyor must be discussed in this group and the YSN-Pt must be the facilitator of CLGE to share educational programs to allow new jobs and business opportunities outside of Europe.

3. The trend of VGI and Open Data

Open data, can be summed up as "the piece of data or content is open if anyone is free to use, reuse, and redistribute it — subject only, at most, to the requirement to attribute and/or share-alike." (*Open Definition, 2014*).

The Web, on its beginnings, allowed only a "one way" communication between the user and the accessed page. This scenario has been revolutionized with the advent of Web 2.0, which had transformed the role of the user's data flow in the user/web interaction, in a way that new graphics interfaces ("browsers") allowed users to interact with other users and editing web contents. Michael Goodchild (*Goodchild, 2007*) states that, at the turn of this century, the ability of users to put content on the web, have been improved until where it was possible to build sites that are constituted almost entirely of user generated content (UGC). The amount of UGC on the Internet has increased rapidly due to Web 2.0 and had brought the technology platforms for the dissemination of spatial data. In this context neogeography (which refers to techniques, tools and practices of geography used by non-experts in the area focused on personal or community activities), grew and gained new dominance within Geography. Web 2.0 has enabled hundreds of thousands of people contributions to a virtual representation of the World. (*Graham, 2010*).

In fact, over the past two decades, we have witnessed a massification in the availability and use of geographic information (GI). This phenomenon led to a

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break in the traditional processes of production and dissemination of spatial data which aroused the attention of the academic community in relation to this new reality.

The term Volunteered Geographic Information (VGI), is a special case of UGC web phenomenon proposed by Goodchild to identify the set of tools to create, compile and disseminate GI provided by any person. The fundamental premise in VGI is giving the sufficient means and data, the collective benefits emerge from the sum of individual contributions (*Flanagin & Metzger, 2008*). The use of the local knowledge is the main difference to conventional sources of Cartography. Besides Web 2.0, other factors contributed to the "boom" of VGI, such as the access to GNSS data.

4. The role of YNS-Pt to promote and to develop VGI

Answering the question proposed by CLGE (S3), this chapter presents the strategy to attract people to the educational programs of Surveying. Actually a student needs available data (open/free) to develop his activities. Such as the commercial software provider promotes student versions, the official data producers must share the data to develop non-commercial studies. This is an important step to create more VGI projects and disseminate its learning. It is an excellent way to expose the students to the new business models and to promote open minded teachers too.

a. Promote VGI through OSM

In 2004 the geo-collaborative project OSM was launched. Initially UK's road network map was created and made available for free, as opposed to the paid data. From this experience the movement of open data grews.

Thus, OSM is an alternative to multiple sources such as Google Maps and Bing Maps (not totally free services, with restrictive policies). OSM, faithful to the principles of crowdsourcing (particularly VGI) contained in its genesis, is made available under a license that allowing free access, and subsequent use and distribution of their data.

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In 2013 OSM reached its first million registered contributors. The arising of the OSM project showed that with volunteered contribution it's possible to create a truly free map. However, in Portugal, this map is far from finished. There is a clear need to increase the number of contributors.

The OSM wiki (OpenStreetMap Wiki, 2014) states that "OpenStreetMap enthusiasts can run Mapping Parties. Mapping Parties come in many flavors, but generally the idea is to get together to do some mapping, socialize, and chat about making a free map of the world! It is a convivial community event, open to all, and although some folks will be mapping experts, newcomers are always welcome."

In Portugal the OSM Party activities have been organized sporadically in various parts of the country, with the participation of the YSN-Pt members (*Figure 1*). These are perfect occasions to promote join in friendship, the team building, refreshing the interested members.

Figure 1 - Pictures of past OSM Party activities.

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In order to answer the first two issues (S1 and S2), proposed by CLGE, YSN-Pt intends to promote and organize mapping parties with two main goals: The introduction of OSM to the community in general and bring new mappers to the project; To show the role of the Surveyor and the activities of YSN-Pt. These events will act as a sensor in order to obtain feedback about YSN-Pt.

The mapping parties will be divided into two parts: the field work (data acquisition) based on existing methods (*GNSS Receiver, Walking Papers, Sketchs, etc.),* and officework where the collected data will be inserted and edited (*through the editors ID and JOSM*).

Complementary workshops will educate the members to collect, edit and share georeferenced data. These events will also discuss the tools to interact with OSM data: data processing using open source tools (*e.g. PostgreSQL, QGIS, etc*.) and online services (Geocommons, CartoDB, ArcGIS Online, etc).

The next OSM Party activities are scheduled to be held at Lisbon and Oliveira de Azeméis (October and November).

b. Volunteered survey of the national geodetic network

A geodetic network is composed by triangles (*Figure 2*), whose vertices are points with known coordinates relative to a specific geodetic *datum*, usually observed with high-precision astronomical methods and materialized on the ground by pillars of masonry (vertex).

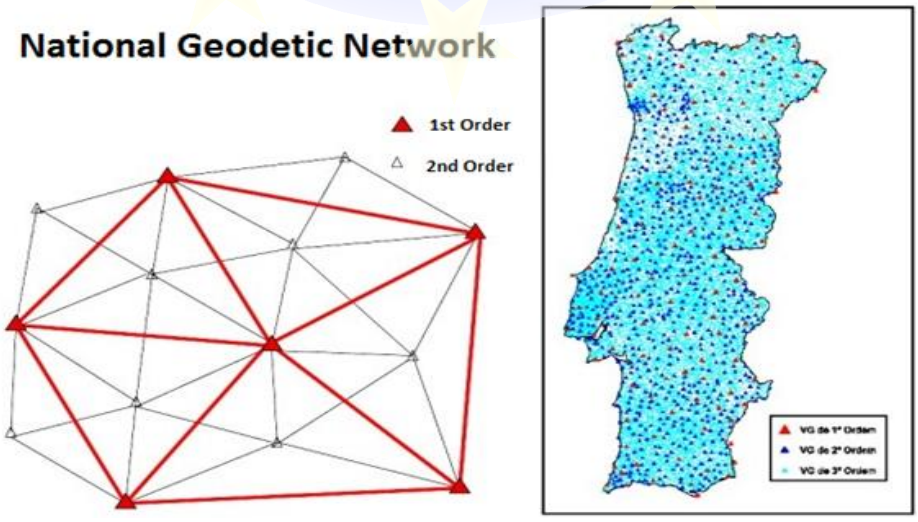

Figure 2: Portuguese Geodetic Network

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The observation of the Portuguese Geodetic Network, was completed in 1888 (*Casaca et. al., 2005*) after nearly a century of installation and observation works (started in the eighteenth century). The maintenance of this infrastructure is the responsibility of the DGT (National Mapping Agency in Portugal) and is composed of three national orders (*Table 1*).

Table 1 - How is the Portuguese geodetic network

Order	**Brief description**	**Distance between vertices [km]**	**Number of vertices**
1st	The main network, consists of vertices materializes by great pyramids of masonry.	30-60	~120
2nd	This network is used frequently. During surveying works is usual to found more than one vertex (conical structure) of this order.	20-30	~900
3rd	Network consisting of masonry vertices smaller but with a similar shape to those within the 2nd order.	5-10	~7000

With the widespread methods of satellite positioning (GNSS), the importance of geodetic networks seems to have been forgotten. In 2009 a new observation campaign has been taken for the 1st and 2nd Orders.The maintenance of 3rd order network seems to have been left aside. Most of 3rd order vertices are in bad structural conditions. This may be caused by an idea, that they are not required anymore, which is not true at all.

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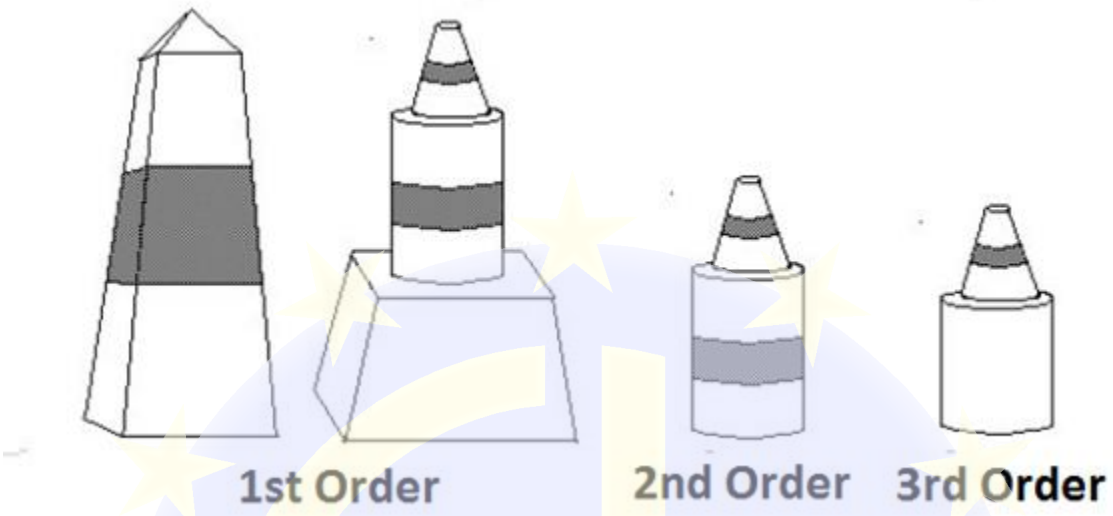

Figure 3 – The structural differences of the vertices used in the Portuguese Geodetic Network

Surveyors who need to perform observations with GNSS receivers (RTK) sometimes deal with the impossibility to capture mobile communications, to send differential corrections, especially in uninhabited areas. In such cases, and if high precision observations are needed, the solution is to install a fixed station in the vertex to send differential corrections by radio.

Therefore, it is necessary to have accessible routes to the vertices and ensure that its condition may not endanger the safety of the Surveyors. (*Figure 4*).

Figure 4: Examples of damaged vertices.

To identify the safety conditions, the coordinates of each vertex and the access conditions, YSN-Pt wants to manage the volunteered efforts of the students and professionals (asking for maintenance need, if necessary). These acts will be reported using a data infrastructure, with GIS procedures. The main goal is to

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report the 3rd order vertex, after a first training campaign with 2nd order vertex. During the implementation (*Table 2*), YSN-Pt will search a partnership with DGT.

Table 2 - The milestones of the WP3

Milestones	**Description**
Milestone 1 (3.1)	Definition of the methodology to be adopted
Milestone 2 (3.2)	Selection of regional coordinators inside OE (from the North, Center and South region headquarters)
Milestone 3 (3.3)	Workshops
Milestone 4 (3.4):	Team work to observe and maintain the third order vertices. The most active groups should be awarded
Milestone 5 (3.5):	Development of the GIS platform

c. Volunteered thematic webmaping

The GI is a key factor in the daily life of many professionals, but also for personal use. Interoperability between different datasets and producers is the present good practice to allow the dissemination of the thematic maps in the social media networks (e.g. representing an international geopolitical crisis).

Nowadays, people have more tools and knowledge about how to create or share content with geographical reading – often the information has not georeference or the scale/resolution are forgotten. When the viral effect is conquered, the map has thousands of views and positive feedbacks.

To do this it is usual to share a single URL with the link for the map to get it, using OGC (Open Geospatial Consortium) standards. Twenty years ago, the effort to share GI through Internet and its costs discouraged people to feel the passion to create their own map. Although the geo-storytelling examples are increasing this

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passion and became popular, with ESRI and Google boost initiatives (Story Maps – ArcGIS and Tour Builder – Google).

Then, why cannot a Surveyor be popular? For instance it is usual to talk about geogeeks. Eric Schmidt, CEO of Google, defined a geogeek as "somebody who is enthusiastic about geography and the technology that creates maps and analysis using diverse sets of data". This quote represents the Surveyor!

The YSN-Pt aims to show how a Surveyor can be useful to the geogeeks, society and the mass media. All the developed maps must have the YSN logo and his partners/funders. The usage of an international network is the main advantage of this strategy to spread the maps and become its popular. Each milestone of this WP is described in the *Table 3*.

Table 3 - The milestones of the WP4

Milestones	**Description**
Milestone 1 (4.1)	Design of the the first maps to test the impact.
Milestone 2 (4.2)	Get more players: CLGE and YSN-FIG. The 2nd FIG Young Surveyors European Meeting will be the first stage to enroll new partners.
Milestone 3 (4.3)	Use the YSN to share the maps and to enroll new members to help these activities and to work with the Media parties of each country. The FIG Working Week 2015 will be the main stage to enroll new partners.
Milestone 4 (4.4):	Create an international network of Young Surveyors members to visit in-situ the disaster areas and to collect geographical information for the responsible authorities. To fulfill this milestone is expected the presentation of the project in some international events. A partnership with Engineers Without Borders is desired.

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5. The plan

Answering the first question propose by CLGE (S1), the YSN-Pt is working to be established inside the OE-EG, with an elected board. This need was identified after the 1st European FIG Young Surveyors European Meeting.

The VGI concept, to prove the role of the Surveyor in the society, will be tested by YSN-Pt. The wish of the Portuguese team is to share the Best Practices of the plan to the international networks, persuading other young professional groups across Europe.

The plan was designed for the next 3 years. The Work Breakdown Structure (WBS) was divided in four autonomous WP (each one has its own program and different managers). The first milestone (WP1) is related with the setup of YSN-Pt. WP2, WP3 and WP4 will be launched when the elected board starts its mission.

Table 4 – The WBS for the next three years of the YSN-Pt

Work Package (WP)	Description
WP1 Setup of YSN-Pt	The setup of YSN-Pt is the main goal for the next months. The end of this WP will happen with the elections for the board of YSN-Pt.
WP2 OSM Parties	The organization of some OSM Party events will test how the community is motivated to follow and contribute with the YSN-Pt.
WP3 Volunteered geodetic information	Actually Portugal keep the 1st and 2nd order network of Geodetic vertices. However the 3rd order of the network has not maintenance. The goal is to help the field surveyors to know where the geodetic marks are in good condition.
WP4	This WP will spread the role of the “Surveyor” through the

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Volunteered webmapping	social media platforms and allows experts of any country to share their knowledge about a specific issue through the YSN.

These WP were planned like a roadmap, considering the needs of each one. Each WP will have a project manager only, aided by task managers and with the help of the new members. The help/funding of the national and international organizations will be crucial to boost the initiatives. CLGE is part of the strategic vision of YSN-Pt to put the efforts in the European strategy to the Surveyor. The target of YSN-Pt is to enroll the students of the main education centers of Portugal and many of the young professionals.

The *Figure 5* shows the roadmap planned by YSN-Pt. During 2015 the YSN-Pt will elect the first national work team, with regulations and responsibilities. At the moment it is not reasonable to establish the exact deadlines for each WP, but the Setup Team has an evident long-term plan (until 2020) to help the activities of the first elected board.

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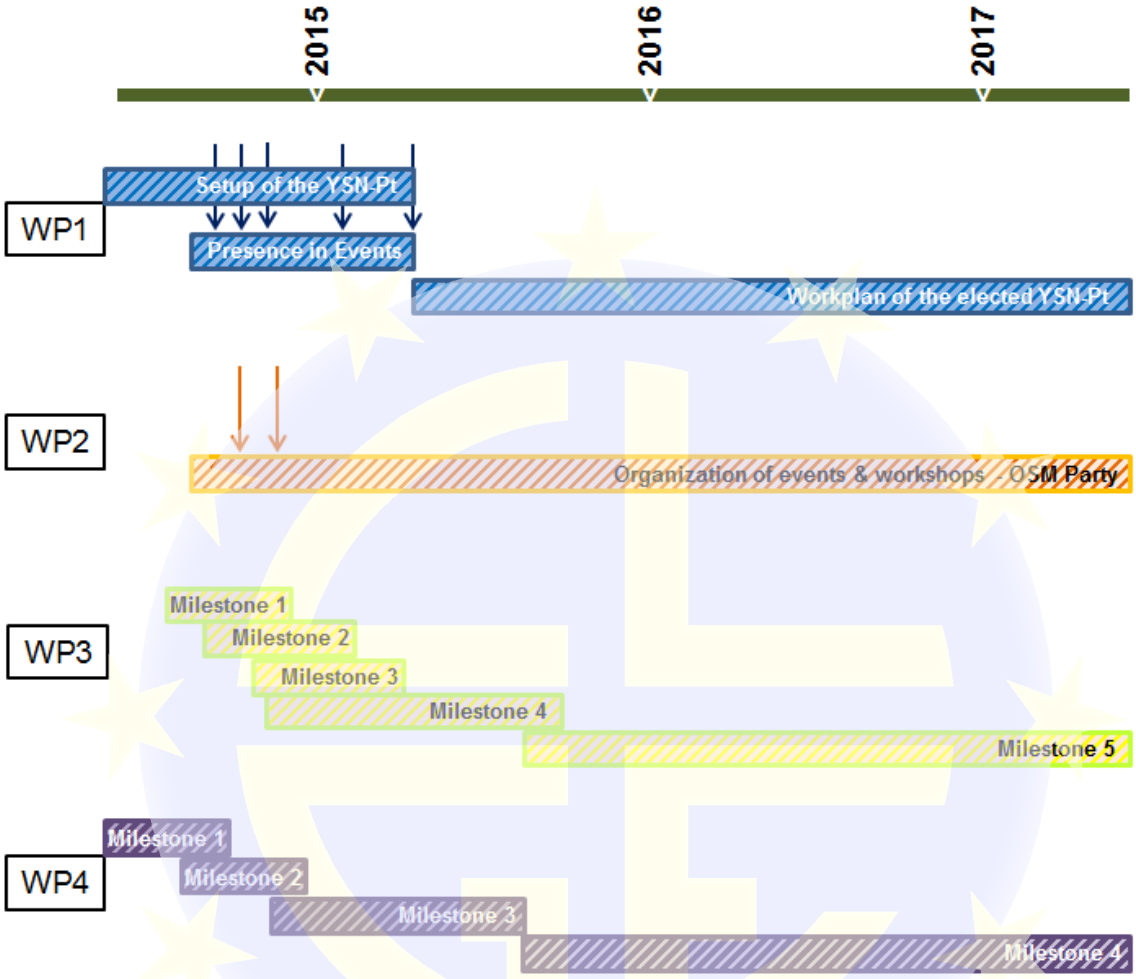

Figure 5 - Simplified Gant map about the YSN-Pt activities in the next 3 years (2014 - 2017)

a. The targets of the next 3 years

Such as the deadlines of each WP are not exactly defined, the targets for the next 3 years may seem like indicators to lead the tasks to the success. The YSN-Pt will follow the next four target vectors:

- **Education:** The YSN-Pt wants to work with Universities, promoting workshops and talks during the classes. The WP1 will promote this vector.
- **Open Data/VGI:** The plan to boost activities related with Open Data and VGI is a strategic action to update the trends of the profession and to induce the decision makers to change the mind. The WP2, WP3 and WP4 will promote this vector.

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- **An elected board:** The YSN-Pt has a well-defined roadmap to show how important can be the interaction between the young professionals, to influence the Senior professionals too. The elected board will have a national contact point, but regional contact points too, close with all the portuguese Surveyors. The WP1 will promote this vector.
- **Societal contribution:** In many of the European countries is not easy to explain what a Surveyor is and what is his role. YSN-Pt will try to be one of the ways to shows the definition of Surveyors, through actions. The proposal activities of WP2, WP3 and WP4 are the main arguments to show how a Surveyor can be useful to the society. The international partnerships between nodes of the YSN will provide the improve of the capacity building, not only to be a Portuguese initiative, but to be a Global in-situ support to the disasters.

b. Budget needs

Despite the volunteered contribution with less costs advantage, to develop the WP, YSN-Pt estimated the cost to the next 3 years. The budget plan is considered in the *Table 5*.

Table 5 – The budget plan for the VGI activities of the YSN-Pt in the next three years

Workpackage	Description	Direct costs	Funds / Partnership
WP1	Setup of YSN-Pt	residual	OE-EG
	Events - 2nd FIG European Meeting	1.000,00 €	OE-EG/External fund
	Events - OE day	500,00 €	OE-EG
	Events - ENEG	500,00 €	OE-EG
	Events - CNCG	500,00 €	OE-EG
	Events - FIG Working Week 2015	1.000,00 €	OE-EG/External fund
	Events - 3nd FIG European	1.000,00 €	OE-EG/External fund

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	Meeting 2016		
WP2	OSM Map Parties + Workshops	1.500,00 €	External fund
WP3	M3.1	residual	OE-EG
	M3.2	residual	OE-EG
	M3.3	residual	OE-EG
	M3.4	2.000,00 € + awards	External fund + Partners
	M3.5	500,00 €	External fund
WP4	M4.1	residual	OE-EG
	M4.2	residual	External funds
	M4.3	500,00 € + awards	External funds + Partners
	M4.4	1.500,00 €	External funds

6. Conclusions

In conclusion, the four previous WP gives credibility to the initiative of a national network of Surveyors. The ideas presented in this article are intended mainly to promote the work of the Surveyors, by conducting events and projects that are able:to promote the profession together young people and to actively participate in improving professional skills.

The test of this initiative in Portugal, can be a model to be a replication in other countries. To begin this project, the YSN-Pt intends to engage Portuguese universities.

Thus, with CLGE, an association that represents and promotes the geodetic surveying profession, it seems logical its involvement in the project, to be an asset to the growth of the profession in Portugal. The portuguese association, Portuguese Engineers Association is a very important support to the activity of YSN-Pt, to attract and motivate young students to the fields of the Surveying.. The

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initiatives of the YSN-Pt will be complemented by a clear strategy to show the activities of the Surveyor to the mass media.

The team of YSN-Pt hopes the CLGE may bring motivation to the portuguese youngsters/students, so they could be more active and engaged with the national association.

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