THE AVAILABILITY OF USING OPEN SOURCE GIS IN TEACHING THEMATIC CARTOGRAPHY

Le Minh Vinh[1], Nguyen Thi Thuan[2], Ton Nu Hong Thao[1] and Trinh Van Tan[1]

[1]Cartography, Remote Sensing and GIS session, Department of Geography,
University of Social Sciences and Humanities, 10-12 Dinh Tien Hoang, District 1, HCMC
E-mail: leminhvinh@gmail.com (Le Minh Vinh)
E-mail: tonnuhongthao@gmail.com (Ton Nu Hong Thao)
E-mail: trinhtan1703@gmail.com (Trinh Van Tan)
[2]Department of surveying and mapping,
University of Natural Resources and Environment of Ho Chi Minh City,
236B, Le Van Sy, Tan Binh District, HCMC
E-mail: ntthuan86@gmail.com

ABSTRACT

Using Open source Software has become more and more popular in the recent years. Being teachers in universities, we find it is advantageous to use Open source Software in teaching GIS and Cartography. The decision of using open source software instead of commercial one requires careful analysis and research. To be specific, we have to ensure that the Open source Software has the necessary functionalities and satisfies all requirements for teaching and studying the related subjects.

In this paper, we consider the uses of QGIS or MapWindow in teaching Thematic Cartography. By thoroughly investigating the functions of creating thematic maps (data visualization) and comparing them with the similar ones in commercial software packages, we can verify whether these Open source GIS can be adapted to be used in teaching Thematic cartography.

The result of this research shows that both QGIS and MapWindow can create many types of thematic maps and therefore they are applicable in teaching thematic mapping. Research also suggests some issues that need considerations and improvements to make these Open Source GIS fully adaptable to the requirements for teaching and studying Thematic Cartography.

1. INTRODUCTION

In educating and acquiring knowledge of GIS, a subject of Information Technology, appropriate software for illustration and training should be applied. It is found that there are many advantages in using Open source (OS) Software in training, especially in the context of globalization, as Vietnam has become a member of WTO and the Intellectual property law is activated in VN.

Beside the advantages such as free of charge, free source code assessing , continuous development by enthusiastic community of volunteer programmers,…, Open source GIS also have some drawbacks such as the lack of detailed manuals, lack of some functionalities, user interface may be unfriendly for the beginners…

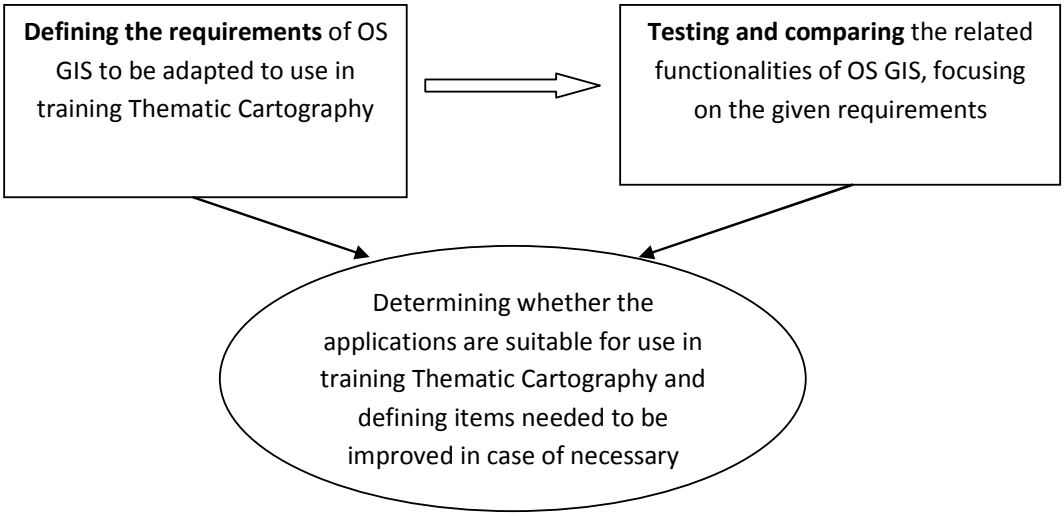
In our opinion, there is no best software but there is only suitable one. It means that every application has its own strong and weak points and thus we should carefully consider them in specific circumstances to choose the most appropriate one to use. For this reason, to make the decision which OS GIS application to be used, some analyses have to be done to ensure that the OS application possesses necessary functionalities and satisfies all

requirements for teaching and studying the related subjects.

This research has been done to analyze the availability of using open source GIS applications in teaching Thematic Cartography.

2. METHOD

The research framework is shown below:



2.1 Defining the requirements

First of all we need to clearly define the requirements of OS GIS to be adapted to use in training Thematic Cartography. There are general requirements including:

- The ability to handle many common file formats (compatibility)
- Being user- friendly interface for the beginners (students)
- Sufficiency of documents, manual of instruction…
- The existence of substantial, active and co-operative user community that helps in turn to build up a market for support and customization of the software

The aim of subject "Thematic Cartography" is to let students visualize spatial information and create well designed, informative maps. Being teachers in Thematic Cartography, beside the general requirements, we also define specific requirements:

- The software can express main study concepts in Thematic Cartography such as "thematic layer", "type of map", "data normalization"…
- The most important thing is the ability of creating thematic maps. There are many types of thematic maps. The types of thematic maps can vary considerably depend on the phenomena/ data, which then very diversify by their spatial aspect (point, line, region or statistic surface…) and by their attribute- non-spatial aspect

(qualitative or quantitative). In Thematic cartography, students have to choose the right type of map for best visualization of given data. Therefore the application that is used in training Thematic Cartography must be able to generate multiple types of thematic maps.

- The ability of creating map legends. In Thematic cartography, we try to create not only digital maps but also paper ones. As opposed to digital maps where information can be got without legend, in paper maps the legend plays an irreplaceable role. The best solution should be that the software can support creating clear, readable, meaningful legend.

The above are main requirements that we should concern in our analyses. In this research, we will not mention aesthetics aspect and other functions of software.

2.2 Testing and comparing the related functionalities

In this research, we have decided to analyze the following OS GIS software: QGIS and MapWindow.

We have to verify if the software meet each of requirements. For the specific requirements, we use the same data set to analyze the concerned functionalities (creating thematic layer, creating legends). For each type of thematic maps, not only we have to analyze whether the software support the creation of that type of map and but also have to consider how customizable are the symbols. In some cases, we try to find out how the commercial software execute and handles the functionalities. Our purpose is not to show whether the commercial package is better or worse but to notice how we can improve those functionalities in OS packages

.

3. RESULT

3.1 General requirements

(1) Both applications can handle with raster and vector data. QGIS allows working with many common data formats (shapefile, coverages, PostScript, MapInfo files…) without any conversion. MapWindow supports fewer file data formats; it does, however, provide tool of spatial converter though with limited capability.

(2) In consideration of user interface, it's difficult to determine which one is better because it depends on many factors such as the skills, using habits, personal favors… of users. With subjective thinking, we have found that both applications have user -friendly interface with set of familiar menus, icons and concepts.

(3) On the website of QGIS and MapWindow, there are many useful documentations and manuals of instruction which help us to make acquaintance with the software; however none of them is in Vietnamese. This fact is also an obstacle for Vietnamese students at the moment, but it can be overcome then.

(4) There are active and co-operative user communities that support and develop both applications. QGIS has been established for the first time in early 2002, and since then it has been continuously maintained by an active group of volunteer developers. The newest release is "lisboa" in June 2012. MapWindows was established in 1998, similarly, updates for MapWindow GIS are regularly released by a group of students and volunteer developers. The latest version (4.8.7b) is in July 2012. There are dedicated discussion forums to contribute to the development of both of software.

3.2 Specific requirements

Type of Maps	QGIS	MapWindows	Additional notes
Nominal data with points and lines	Support many different types of symbol, allow users to create and get their own symbols (base on supplied symbol or file .svg)	Support many different types of symbol, allow user to create and get their own symbols (file png, .bmp) Line symbols can be created based on supplied point symbols	
Proportional/ graduated symbol (with points and lines)	Data maybe classified (5 methods of classification with no custom mode) or be unclassified/unique The size of symbols can either be defined manually or being automatically displayed by linear scaling Legend is readable but lengthy in case of unclassified data	Data maybe classified (3 methods: natural break, equal intervals, quantiles + custom) or be continuously (unclassified) User can define the symbol sizes (only) by giving minimum and maximum values or manually Legend is readable but lengthy in case of unclassified data	The linear scaling can cause too big or too small symbols in case of very diverse data set (the gap between min and max values is very large) MapInfo supports some other methods of scaling (square root, logarithm, constant)
Choro-chroma-tic map (Nominal area data)	Support different types of region symbols, allow users to create their own symbols	Support many different types of region symbols with various fill types and allow users to create their own symbols	

Type of Maps	QGIS	MapWindows	Additional notes
Dia-gram (located graph)	Diagram can be created but this function is not a strong point of QGIS. The application supports to create 2D Pie charts and vertical multiple bar charts. The appearance and position of diagrams cannot be altered (except the color). Only one method of scaling (linear) is supplied There is no legend for diagram (that is inconvenient) There are two icons ("diagram" and "overlay") that support the same function of creating diagram, which may leads to confusion.	Support two types of diagrams: 2D and 3D pie charts and bar charts (only vertical multiple bar chat) The appearance and position of diagrams can be defined quite flexibly, allowing representing of good thematic layer Users can alter only min/ max size and then, the remained sizes will be correspondingly generated. Legend is not readable enough as it does not show the scale	MapInfo support various types of diagrams (stack bar, haft pie…) and 3 types of scaling (square root, logarithm, constant)
Choro-pleth map/ statistic surface	Data maybe classified (5 methods of classification with no custom mode) or be unclassified There are many given color ramps and users can create their own ones	Data maybe classified (3 methods: natural break, equal intervals, quantiles + custom) or be unclassified Users can choose from given color schemes/ramps or create their own ones	
Isoline /Isarith mic	Support interpolation function that allows to create isolines from set of data points	Support to generate isolines (by MapWinGIS.Grid)	
Dot density	Currently not available	Currently not available	MapInfo, ArcMap support to create Dot maps with different styles
Flow-line map	Create manually	Create manually	
Carto-gram	"Cartogram Creator" plug-in can support to generate cartogram but with limited options	Currently not available	ArcGIS support tools for cartogram creation (Cartogram Creator)

4. CONCLUSION

Both Quantum GIS and MapWindow GIS satisfy the majority of the given requirements and can be use (extensively) in teaching and studying Thematic Cartography. Each application has its own benefits and drawbacks that cannot be ignored. The ability to create meaningful legend, methods of scaling for quantitative data, customization of appearance and position of symbols/ diagrams are fairly important functionalities which should be taken into account. The research also suggests issues that require further consideration, (modifications) and improvements so that these Open Source GIS application become fully adaptable to all the requirements for Thematic Cartography education.

5. REFERENCES

Daniel P. Ames, June 2011. *A Brief History of the MapWindow GIS Project*.
<http://www.mapwindow.org/apps/wiki/doku.php?id=brief_history>

Dan Ames, August 2011. *MapWindow 4 Users Manual*.
<http://www.mapwindow.org/apps/wiki/doku.php?id=mapwindow_4_users_manual>

Terry A. Slocum, 1999. *Thematic Cartography and visualization*. Prentice Hall, New Jersey.

Quantum GIS
<http://www.qgis.org>