

## **STAN: a software for a Community Strategic Framework**

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### *ABSTRACT*

*The application of a community strategic framework (CSF) (Scattoni, 2018) requires simple and low-cost techniques. CSF is an approach communities can work with to identify the main characteristics of the problems they are facing and to help with making decisions about these problems. This article outlines the essential and immediately operational elements for applying STAN (SStrategic ANalysis)*

*software. This develops from the “strategic choice” approach (Friend and Jessop, 1969) and, while computerised techniques have been developed, they have been found to have limitations and have been little-used (Friend and Hickling, 2005). Some applications have been attempted in the Italian context (Giangrande and Mortola, 2005) but without a significant following.*

*This paper aims to show how a computerised technique called STAN, which developed about ten years ago, can be used for constructing and managing a CSF. Indeed, this technique has characteristics that are well suited to community use because, in particular, it requires only basic knowledge of computer science, which we can assume to be present in many small groups of people.*

*An important additional condition is the STAN software’s free license, available as open source software. The method’s versatility makes it possible to integrate it properly where the formation of the CSF is oriented to cooperation, information exchange, or possible conflict comparison between various stakeholders, as well as decision makers.*

## **INTRODUCTION**

The article is formulated as follows. Previous attempts to use STAN software will be analysed. It is particularly important to assess the potential, as well as the limits, which has not permitted the development in the past. Thereafter, this paper will evaluate the possible use of such a technique in a strategic choice approach. The paper then focuses on the steps required for using STAN in a CSF and presents specific steps for constructing the CSF, considering the assumed minimum conditions. The identification of the actors, perception of the problems and of the possible alternative courses of action are then analysed to solve the perceived problems. The identification of possible conflicts then outlines negotiating strategies.

The paper then offers a brief review of the applications so far carried out in experimental teaching exercises and proposes the possibility of developing a basic guide for using STAN software. Finally, the conclusions focus on the possible technical developments in relation to CSF.

## **STATE OF THE ART**

### **STRATEGIC CHOICE**

The method refers to the strategic choice approach for urban planning. Friend and Jessop summarise the essential features in the fifth chapter of their book, which was published in 1969 (Friend, Jessop, 1969).

The approach is innovative, looking at planning as a continuous process of interaction and dialogue between a system of government and a community system.

Often, the demands of the community system are confused and unstructured and the government system has the responsibility to structure community demands and needs. The authors describe this process through progressively complex diagrams and a particularly important contribution is the classification of uncertainties characterising public decision-making processes in general and those of planning in particular. They identify three sources of uncertainty. The first uncertainty is related to the knowledge of the environment (UE, Uncertainties related to the Environment), with reference to the difficulties of urban analysis, particularly in relation to the forecasting tools.

Setting out a problem and the possible options to solve it is called “decision area”. The combination of the possible options allows for a whole range of possible general solutions to be identified.

The alternatives may, in fact, emerge from the study of the technical system of government, or from the knowledge expressed by the community.

The various options are evaluated from different points of views. Each stakeholder can express different preferences. Further, each option can have different consequences in relation to objective parameters as environmental impacts, costs, etc.

The decision process does not necessarily occur according to a strict sequence. Often, it is done through progressive mutual adjustments, which may also go through community participation, organised in various ways.

#### STRATEGIC CHOICE FOR CSF

In Italy, the strategic choice approach has not found many applications. In 1974, Baldeschi and Scattoni provided the first translation in Chapter 5 “The nature of planning” of Friend and Jessop’s book (1969). The following year, Balbo (1975) introduced the AIDA technique. Much later, Giangrande and Mortola (2012) made the first operational test. Only in Grosseto’s structure plan does the strategic choice approach find application. The Grosseto Structure Plan remains the only large-scale plan using strategic choice (Scattoni, 2007). Looking at these few theoretical and practical experiences, it is necessary to evaluate how the approach can meet the characteristics of a CSF. In fact, in CSF, common knowledge prevails over expert knowledge. In this paper, we try to demonstrate that the approach is suitable for this requirement if it is driven by a simple and understandable sequence and with the aid of an equally simple, computerised procedure. The operations for the framework’s

construction are strategic choices made from progressively identifying problems. The definition of the options proceeds from the simplest, which implies no action, to the complex.

For each problem, the “no action” option needs to be considered (keeping the existing situation, i.e., the status quo) and a generic change statement then develops over time with increasingly specific options. The technological support can be managed by a member of the group with only minimal computer knowledge. The minimal expertise required involves simple operations, such as software installation and management.

#### PREVIOUS EXPERIENCE

In this paragraph, the discussion is about the STAN software as the support for strategic choice. Such software was developed in two phases.

The first phase takes shape in the 70s at Newcastle University by Openshaw and Whitehead (1975). They developed software called DOT (Decision Optimising Technique). They derived DOT from the AIDA (analysis of interconnected decision areas) approach developed at IOR (Faludi and Mastrop, 1982). The second phase concerns reusing some of those experiences to finally outline a simple and intuitive tool: STAN software. It requires limited technical skills and is easily accessible even in poorly structured or spontaneous groups,

with limited resources, but which are interested in building a community strategic framework.

The same IOR school later developed the STRAD software, which is limited to the treatment of subsets of the decision-making framework identified with the strategic choice method.

Above all, STRAD helps to frame the decision-making process through workshops in which various stakeholders participate. However, in this method, technical expertise is essential (Friend J.K., Hickling A., 2012, chap.10).

Openshaw and Whitehead's abandonment of the DOT software's development from 1985 had different technical reasons, mainly concerning the computer limits at that time. Openshaw and Whitehead investigated the interactive use of DOT when adequate computer power was available at the time only at a few universities. Only in their last contribution did Openshaw and Whitehead (1985) sense the importance of the personal computer but obstacles concerning easy use in practice still remained at that time.

THE NEW PHASE: STAN DEVELOPMENT



Picture 1 - STAN initial banner

The Grosseto Structure Plan's preparation (2000-2006) provided the environment for developing a technique to support the strategic choice approach, operated by a group of planning consultants from Sapienza Rome University. The main inspiration for STAN originated from this work, with a research group comprising a planner, an expert in operational research, and a computer expert. Unfortunately, STAN was not ready for the Grosseto Structure Plan but it later found several applications, mainly in university teaching. Its official presentation took place in 2005 in a seminar taken at the Department of Urban and Regional Planning. All of this has created a research group formed mainly by urban planners and computer and operational research experts.

The STAN software, mainly based on linear programming 0/1 elements (Ricca and Scattoni, 2008), comprises methods and models



of operations research suitably designed to provide a decision support tool, in line with the principles and processes that characterise the stages of strategic decision making. Thus, it is developed from the work of Openshaw and Whitehead and exploits the possibilities of computers available today on the market, in addition to exploiting the advances that have been made in software. Through the tools offered by the Java programming environment, a graphical interface has been developed that allows even complex strategic frameworks to be managed.

The user interface allows the integer linear programming models to be set up by simply selecting them from a subset of possible methods including those available. The following are the criteria (Ricca and Scattoni, 2008) used for developing and setting up STAN software:

1. debate: STAN software allows the stakeholders involved in the planning process to participate interactively in developing the strategic framework;
2. flexibility: the strategic framework can be easily modified according to the dynamics of the decision process;
3. traceability: the strategic framework can be commented on in its entirety through the placement of text, which allows for changes to the strategic framework over time to be described in order to be able to reconstruct the main transformations;
4. low cost: STAN is an open-source software under the GNU license and is, therefore, freely downloadable, testable in the source code, and possibly modifiable. The users only need a

personal computer and possibly a video projector for use during sessions. STAN explores a large number of solutions through the aid of mathematical and statistical tools. The role of the software is not to replace the decision maker but to allow the actors of a given context, based on debate, to explore the alternatives in the decision-making process. It can help with assessing the effects of preferred options and provide the traceability of the decision-making process.

STAN, thus, assists the decision makers, offering a strategic choice environment, looking at:

- decision areas, which represent the structure of the problem;
- options, the alternatives of choice for every possible decision area;
- criteria to evaluate the different alternatives;
- the relationship between the options of the various decision areas.

In April 2014, the research group released version 2.0, incorporating software updates and developing a function to export the CSF in a format compatible with MediaWiki. Such a function provides the possibility of interaction between a decision wiki database (Scattoni, 2018) and STAN software. A worked application is in the appendix.

## **CONCLUDING REMARKS**

The STAN technique looks to play a key role for the CSF as imagined by Scattoni (2018). It is economically sustainable for any voluntary group, even if they are small. The software is available for free, the necessary technical knowledge is minimal, and it can be assumed that, within each group, there are members able to manage STAN appropriately. Defining decision areas through meetings and opinion exchange, either live or through the web, is an easy task. Once started, the process of defining options and actors' positions should follow without significant difficulty. In this respect, the link with knowledge organised according to a classical strategic choice approach is important. A wiki database based on the strategic choice approach can further facilitate the use of STAN. Decision areas, options, value judgements by stakeholders (that of the group, as well as those deduced from other actors), and interconnections among decision areas can easily feed into a STAN exercise.

Consequently, the CSF can also be built through easy steps in a group meeting, using basic equipment like a computer connected to a projector.

Using STAN allows for the summary of the CSF on a single page where all the essential elements can be read. On the other hand, the page elements can be described through text, even entered during the meeting with synthetic notes and, if necessary, refined later. Such a feature is particularly important for preparing reports to support the

group in different situations, such as the public participation exercises launched by the “government”. Further, the ability to export to an Excel format can simplify the analysis of a CSF.

On the other hand, there are obstacles to be considered for full implementation of the technique in a small group context. The initial absence of experience may be a significant obstacle. Until now, the implemented experiences occurred in a university teaching environment. In a real-world situation, it is almost certain that a proposal from one or more members of the group can encounter scepticism by others. Regardless that the technique is simple to understand, in situations of conflict between community and government, use of STAN may appear an alien and ineffective exercise. It could appear unable to help in managing decision making where impairment is evident, especially in terms of access to sensitive information. Of course, the prior construction of a wiki related to the decision-making process can help to dissolve scepticism. It is, therefore, important to make clear that the technique is not a black box for producing solutions but only a means to order them in an operational way for self-organised groups.

Future research on STAN can develop according to two main directions: software and empirical work. As far as software is concerned, different research activities must be implemented. It is necessary to provide regular updates, especially in relation to Java updates and releases. As a matter of fact, Java guarantees operability

with most operating systems: Linux, Windows, and Mac. The transition from 1.0 to the current 2.0 version of STAN is needed to ensure the software is used with new releases of Java. Also, implemented functions of the exported CSF need to be in a compatible format with the MediaWiki software in order to give users the opportunity to interact with both systems.

More importantly, the effectiveness of STAN can greatly benefit from a facilitated interrelationship with the information base on the wiki. For non-technically-oriented groups, it is important to simply provide inputs in terms of decision areas, options, different actors involved and related value judgements, as well as technical criteria and functional relationships.

A last but not least aspect is that of collecting experience from small groups using the software. Such documentation would be of great importance to work on possible improvements. For such a purpose, a platform linking different experiences could be of value for research.

#### **APPENDIX - OPERATING PROCEDURE**

The appendix is designed to show an example of dealing with a decision area starting from a CSF using the latest version of the STAN software (<http://stan.sourceforge.net/>).

The diagram below is the basis for identifying the elements that will make up a decision area, so called because of the models and the

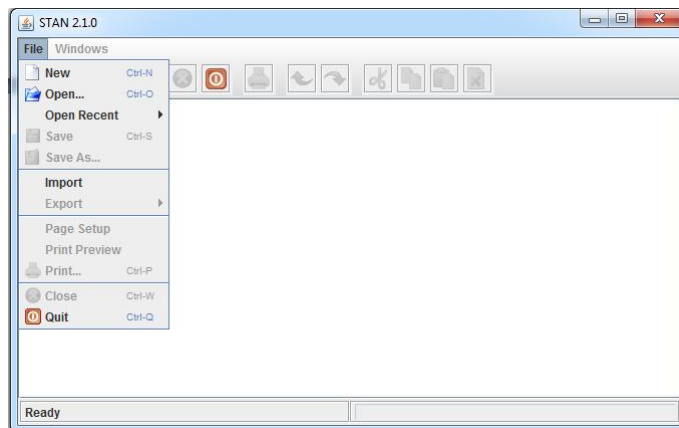
methods shown in the previous paragraph. The set of decision areas and their contents will form the CSF.

Box n.1 shows the structure of a decision area.

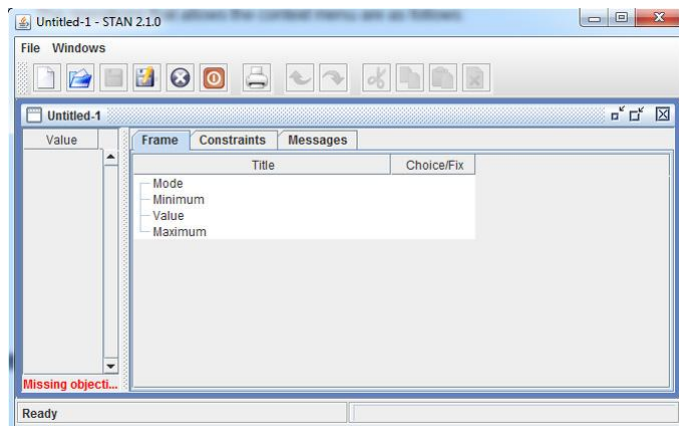
<p><i>TITLE OF THE DECISION AREA</i></p> <p><i>PROBLEM</i> <i>Description of the problem.</i></p> <p><i>OPTIONS</i> <i>Possible options for a resolution to the problem.</i></p> <p><i>ACTORS</i> <i>Main actors involved in the problem.</i></p> <p><i>RELATED AREAS</i> <i>Decision areas related and, therefore, mutually influenced.</i></p> <p><i>LEARN ABOUT</i> <i>Documents to learn about and resources to support the knowledge of the problem.</i></p>
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The STAN has a common type menu. In the bar at the top of the window, you can find File. With left-click, it will open a drop-down menu through which you can make basic operations on CSF.

With left-click on File-> New, you can create an empty CSF while by left-clicking on File-> Open you can open an existing CSF. Some example scenarios are available in the examples directory within the STAN software folder.



Picture 2 - Left-click on File



Picture 3 - New empty CSF

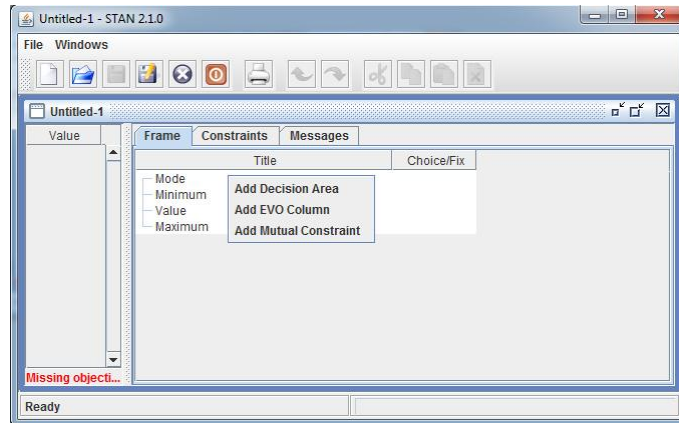
Once opened or created, you can save the CSF by left-clicking on File-> Save or File-> Save as. The difference between the two operations is that the first stores the same file from which you opened the CSF while the second allows you to specify a new file on which to save the scenario. It is possible to open multiple scenarios and call them from the Window menu item, which can be found to the right of the File menu. You can close the single CSF by left-clicking on File-> Close.

The software also enables the printing of a CSF report. This report is visible in preview mode by left-clicking on File-> Print Preview and can be forwarded to the printer by left-clicking on File-> Print.

To exit the program, left-click on File-> Quit.

The insertion of the data is done through a pop-up context menu, which is able to display the type of operation permitted depending on the row and column in which the pointer is located at the moment in which the operator invokes the menu with the right-click.





Picture 4 - right-click context menu

The operations that allow the context menu are as follows:

- add / edit / delete a decision area with the possibility of inserting text that describes the problem to be treated;
- add / edit / delete an option with the possibility of inserting text that describes the proposed solution;
- add / edit / delete an EVO column going to identify the actors/stakeholders or any other constraint criteria;
- add / edit / delete the mutual condition of influence between the options of the same area of the decision or from the options of the other decision areas.

The documents collected in support of knowledge cannot be inserted directly into STAN software. However, in the case of a publication of the CSF on a wiki-type website, these documents will complement the decision area as an integral part of it.

The wiki-type website can also be used for storing a state of the CSF at a given moment in time. Similarly, the wiki-type website, thanks to the functions of discussion and participation, can be a source of items to complete or update the CSF on STAN software.

Once you have entered all the data, we will have the CSF to be analysed in tabular form. In the first column, we will find lines of text containing the options, the latter grouped by decision areas that may contain descriptions or comments entered into the correct field via the context menu, the same thing is true of the decision areas that are freely open to comments and sortable freely by the right-click menu.

In the second column, ordered from left to right, you can find incompatibilities and stakeholders. Usually, among the first columns, you can find mutual exclusions between options incompatible with each other and in the columns to follow, we can identify the stakeholders. Alternatively, other constraint criteria can be inserted. Each constraint can be set either as a target function for maximum thresholds of values, as a target function for minimum value thresholds, or as an objective function between a pair of minimum and maximum values.

For each stakeholder, there is an evaluation column expressed in a choice scale (e.g. from 1 to 10) that must be maintained homogeneous for all the evaluations.

In addition to subjective judgments for each related stakeholder STAN may consider continuous measures such as those related to costs, environment, etc.

STAN allows for moving the original columns and lines by the user.

Therefore the software facilitates the planning process during the various phases of comparisons and negotiations.

#### ACHIEVED RESULTS

This paragraph looks at an example in order to clarify the way STAN functions.

It is from a work carried out in 2006, taken from exercises in final dissertations (Opolka, 2006). The thesis tests the method (strategic choice approach and STAN) in an unplanned Rome neighbourhood.

The thesis was built through the local organisations helped by the formulations of CSF. It identifies decision areas, options for each one, the stakeholders involved, and the interrelations between decision areas.



Picture 5 - Initial CSF with three decision areas

Box n.1 shows the structure of a specific decision area.

***DECISION AREA – SEWERAGE NETWORK***

***PROBLEMS***

*Increasingly reported sewage spills that resulted in extensive damage to homes.*

*The causes were:*

- *Defective sewerage network*
- *Lack of maintenance;*
- *Many of the old drainage canals were closed.*

***OPTIONS***

1. *Maintain the current situation;*
2. *Strengthening of the existing sewerage network,*
3. *New sewerage network;*
4. *Scheduled maintenance of the sewerage network;*
5. *Scheduled maintenance of the sewerage network plus strengthening of the existing sewerage network;*

<p>6. New sewerage network plus strengthening of the existing sewerage network.</p> <p><b>ACTORS</b></p> <ul style="list-style-type: none"> <li>- Main municipality of Rome;</li> <li>- Local municipality district;</li> <li>- Committee of district;</li> <li>- Small owners of vacant lots.</li> </ul> <p><b>RELATED AREAS</b></p> <ul style="list-style-type: none"> <li>- Local roads</li> </ul> <p><b>FURTHER ANALYSIS</b></p> <p>Documents to learn about and resources to support the knowledge of the problem.</p>
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Box n.2 shows the evaluation provided by four main stakeholders. The scale is 1 to 5, where 1 is very negative and 5 is very positive for interviewed stakeholders.

<i>Stakeholders</i> / <i>Options</i>	Main municipality of Rome	Local municipality district	Committee of the district	Small owners vacant lots
1. Maintain the current situation	1	2	1	1
2. Strengthening	3	4	2	2

of the existing sewerage network				
3. New sewerage network	2	3	4	4
4. Scheduled maintenance of the sewerage network	3	4	4	4
5. Scheduled maintenance of the sewerage network plus strengthening of the existing sewerage network	3	5	4	4
6. New sewerage network plus strengthening of the existing sewerage network	3	3	5	4

Value	Δ	Frame	Constraints	Messages	Title	Choice/Fix	Main municipality of Rome	Local municipality district	Committee of district	Small owners of vacant lots
5.0		Mode					Expression	Expression	Maximize	Expression
4.0	-1.0	Minimum					-∞	-∞	-∞	-∞
4.0	0.0	Value					3.0	3.0	5.0	4.0
4.0	0.0	Maximum					+∞	+∞	+∞	+∞
2.0	-2.0	Sewerage network								
1.0	-1.0	1 - Maintain the current situation								
End		2 - Strengthening of the exiting sewerage network								
		3 - New sewerage network								
		4 - Scheduled maintenance of the sewerage network								
		5 - As the 4th plus strengthening of the existing sewerage network								
		6 - As the 3th plus strengthening of the existing sewerage network								

Picture 6 - An example of elaboration that displays the preferred solutions for the "Main municipality of Rome" stakeholder

Value	Δ	Frame	Constraints	Messages	Title	Choice/Fix	Main municipality of Rome	Local municipality district	Committee of district	Small owners of vacant lots
5.0		Mode					Expression	Maximize	Expression	Expression
4.0	-1.0	Minimum					-∞	-∞	-∞	-∞
4.0	0.0	Value					3.0	5.0	4.0	4.0
3.0	-1.0	Maximum					+∞	+∞	+∞	+∞
3.0	0.0	Sewerage network								
2.0	-2.0	1 - Maintain the current situation								
1.0	-1.0	2 - Strengthening of the exiting sewerage network								
End		3 - New sewerage network								
		4 - Scheduled maintenance of the sewerage network								
		5 - As the 4th plus strengthening of the existing sewerage network								
		6 - As the 3th plus strengthening of the existing sewerage network								

Picture 7 - An example of elaboration that displays the preferred solutions for the "Local municipality district" stakeholder

Value	Δ	Frame	Constraints	Messages	Title	Choice/Fix	Main municipality of Rome	Local municipality district	Committee of district	Small owners of vacant lots
5.0		Mode					Expression	Expression	Maximize	Expression
4.0	-1.0	Minimum					-∞	-∞	-∞	-∞
4.0	0.0	Value					3.0	3.0	5.0	4.0
4.0	0.0	Maximum					+∞	+∞	+∞	+∞
2.0	-2.0	Sewerage network								
1.0	-1.0	1 - Maintain the current situation								
End		2 - Strengthening of the exiting sewerage network								
		3 - New sewerage network								
		4 - Scheduled maintenance of the sewerage network								
		5 - As the 4th plus strengthening of the existing sewerage network								
		6 - As the 3th plus strengthening of the existing sewerage network								

Picture 8 - An example of elaboration that displays the preferred solutions for the "Committee of district" stakeholder

Value	Δ	Frame	Constraints	Messages	Title	Choice/Fix	Main municipality of Rome	Local municipality district	Committee of district	Small owners of vacant lots
4.0					Mode		Expression	Expression	Expression	Maximize
4.0	0.0				Minimum		-∞	-∞	-∞	-∞
4.0	0.0				Value		2.0	3.0	4.0	4.0
4.0	0.0				Maximum		+∞	+∞	+∞	+∞
2.0	-2.0				Sewerage network					
1.0	-1.0				1 - Maintain the current situation	<input type="radio"/>	1	2	1	1
End					2 - Strengthening of the existing sewerage network	<input type="radio"/>	3	4	2	2
					3 - New sewerage network	<input type="radio"/>	2	3	4	4
					4 - Scheduled maintenance of the sewerage network	<input type="radio"/>	3	4	4	4
					5 - As the 4th plus strengthening of the existing sewerage network	<input type="radio"/>	3	5	4	4
					6 - As the 3th plus strengthening of the existing sewerage network	<input type="radio"/>	3	3	5	4

Picture 9 - An example of elaboration that displays the preferred solutions for the "Small owners of vacant lots" stakeholder

More recently in a final dissertation (Lombardi, 2018), the method was tested in the context of the urban renewal of the *main archaeological area of Rome*. The thesis ends with a detailed evaluation of the results regarding stakeholders' preferences.

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