

Using Set-based Value Modeling to Quantify the Utility of Informant Portfolios

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Abstract: Sex trafficking continues to be an issue in the modern world. Non-Governmental Organizations (NGOs) attempt to eradicate trafficking but lack the same resources as official government agencies; NGOs must conduct a cost-benefit analysis to allocate finite resources. Our methodology of value modeling enables organizations to evaluate informant portfolios within various environments by assessing an informant portfolio's ability to answer information gaps. This is accomplished by viewing individual informants as independent entities and allowing the NGO to score their anticipated usefulness. NGOs rate informants on their placement within the environment, access to pertinent information, and credibility of the information provided. The value model takes these independent assessments to aggregate the anticipated value of a portfolio of informants. This function allows an organization to explore all possible combinations of informants and fully appreciate the accumulated risks of each portfolio.

Keywords: Sex Trafficking, Pareto Optimization, Set Based Value Modeling

1. Introduction

Both governments and NGOs work to fight against sex trafficking. Within the United States, local police conduct investigations and prosecutions while NGOs focus on victim recovery and rehabilitation. Outside of the United States, however, the NGO must often assume more responsibility in the fight against sex trafficking. The degree of NGOs' responsibilities varies as each nation targets sex trafficking differently according to the respective states' priorities: the less a state prioritizes fighting sex trafficking, the more an NGOs must assume responsibility.

Due to cultural and resource differences, intelligence and police organization's information collection systems vary (Cochrane & Monaghan, 2012). Each organization has protocols for obtaining, maintaining, and disbanding informants. For example, the Central Intelligence Agency (CIA) handles informants differently than the National Security Agency (NSA) who in turn differ from local law enforcement agencies. Despite differences, a universal truth binds all these organizations: information is essential to meeting their objectives (Fondevila, 2013). Much of the existing literature discusses specific methods of the recruitment, vetting, compensation, protection, and disbandment of informants. However, this same literature lacks a methodology to quickly assess the actual value of such informants, as well as the risk associated with hiring specific agents.

State-backed organizations have an abundance of resources at their disposal which proves invaluable in their information collection operations. For example, in 1976 the FBI allotted over seven million dollars toward maintaining its network of 1,500 informants (Wolf, 1976). The funds allowed the FBI and similar organizations to gather as much information as possible before they organized the data to obtain the intelligence essential to their missions.

Sex trafficking in Southeast Asia is culturally accepted by a large percentage of its nations' citizens. As a result, governments do not allocate the resources or processes necessary to target sex-trafficking networks. In this case, NGOs assume more responsibility for the investigating and combating of sex trafficking. This is a significant shift in the role in which most NGOs are operating. Therefore, issues such as legal jurisdiction and adequate resourcing begin to manifest. Each of these problems reduces the efficiency and effectiveness of the NGO while additionally drawing focus away from victim recovery and rehabilitation. NGOs also lack the ability to shift vast resources and leverage already existing infrastructure such as police contacts, investigators, and sheer workforce. Without these state tools, NGOs must find individuals who are willing to provide information (i.e., informants). NGOs must empower informants to work with investigators, raise additional

funding and, most importantly, coordinate with the local authorities which have the jurisdiction to arrest and prosecute traffickers.

2. Problem Definition

Figure 1 conceptualizes the cyclical environment in which NGOs operate. The quality of the existing informant network contributes to the total current understanding of the environment. This understanding consists of both known and unknown information gaps. Auxiliary operational needs contribute to these information gaps. Once an NGO identifies new information requirements they utilize informants to gather relevant information. NGOs then assess and analyze this new information to contribute to their current understanding. NGOs struggle to determine how useful certain informants will be and whether using them will jeopardize other operations.

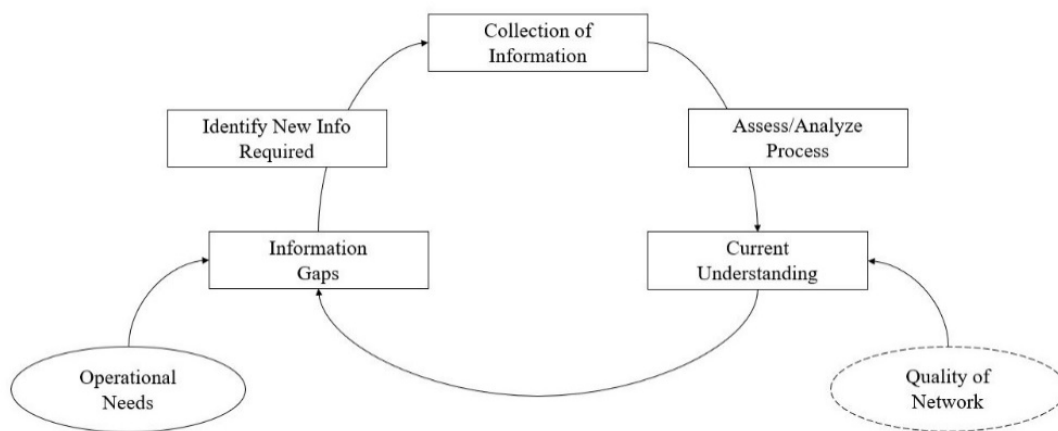


Figure 1. A conceptual understanding of the cyclical nature of the operational environment.

3. Model Walkthrough

3.1 Swing Weights and Global Weights

The solution framework we are developing takes the form of a value model. The intent of our value model is that it is used as a tool to evaluate informant portfolios to better understand the quality of the network. Value models are representations of worth with respect to a client's specific needs and desires. In the context of this problem, the model can help its users assess the value of informants based on the amount and type of information these informants can provide.

The user begins by identifying categories of information necessary to combat sex trafficking. Example information categories can be seen in Table 1. Our current client has selected these specific categories based on their past and ongoing operations. Each category represents grouping of questions that help the client better understand the informant's proficiency within each group. The user develops the questions and categories by assessing its operational environment, identifying its known and unknown information, and thereby creating its information gaps. The user rates each category based on its importance and variability and then assigns a Swing Weight (SW) of any value between 0 and 100 to each category. The Global Weight (GW) for each category is calculated by dividing the SW for each category by the sum of all the SWs (Equation 1).

Table 1. Swing Weight Table

	Cultural Acceptance	Staffing	Brothel Organization	Financial Structure	Legal	Trafficking Logistics	Recruiting	Transportation
Swing Weight	10	40	70	50	30	80	100	90
Global Weight	0.02127659	0.08510638	0.14893517	0.1063829	0.06382978	0.17021276	0.21276595	0.19148936

$$Global\ Weight\ (of\ Swing\ Weight_1) = Swing\ Weight_1 + \left(\frac{Swing\ Weight_1}{Swing\ Weight_2} \right) + Swing\ Weight_3 \quad (1)$$

3.2 Likert Scale

The model allows users to assign ratings to the individual informants using a Likert scale. A Likert scale is method of providing a quantitative measure to items that are difficult to score (Boone and Boone, 2012). The scores generally have some level of subjectivity, similar to the process medical practitioners use to assess their patients' level of pain: on a scale one to ten. In our model, values are based on the user's assessment of each informant's ability to access information concerning specific information categories, as well as that same informant's risk of being compromised while seeking information (Table 2). Our Likert scale ranges from zero (possessing no knowledge of the category) to five (complete knowledge of the category).

Table 2. Likert Scale Table

Informant Name	Cultural Acceptance	Staffing	Brothel Organization	Financial Structure	Legal	Trafficking Logistics	Recruiting	Transportation	Risk
Scrap Metal Owner	3	3	4	2	1	3	3	2	2
Gym Owner	4	2	2	1	4	2	4	2	2
Journalist	4	2	2	3	3	4	2	1	1
Woodworker	4	3	2	1	3	4	3	4	1
Bodyguard	4	4	4	2	1	4	4	4	4

3.3 Portfolios

The model develops a set of portfolios to encompass all possible combinations of one or more informants (Figure 2). Each portfolio also has an overall rating for each category of information as well as the overall risk for that portfolio. These values are calculated by applying the inclusion-exclusion mathematical principle to the individual informant ratings within each portfolio (Chen, 2014). The model then calculates the value of each portfolio by taking the sum of the overall information category ratings for the portfolio multiplied by the global weight for that category.

3.4 Trade Space Analysis

The model additionally determines all portfolios that are pareto optima, or those that offer the best value as compared to risk measured in the chance of compromise (Figure 3). This allows the user to eliminate extraneous alternative portfolios produced in the value model's calculations and leave only adequate candidate solutions to choose from.

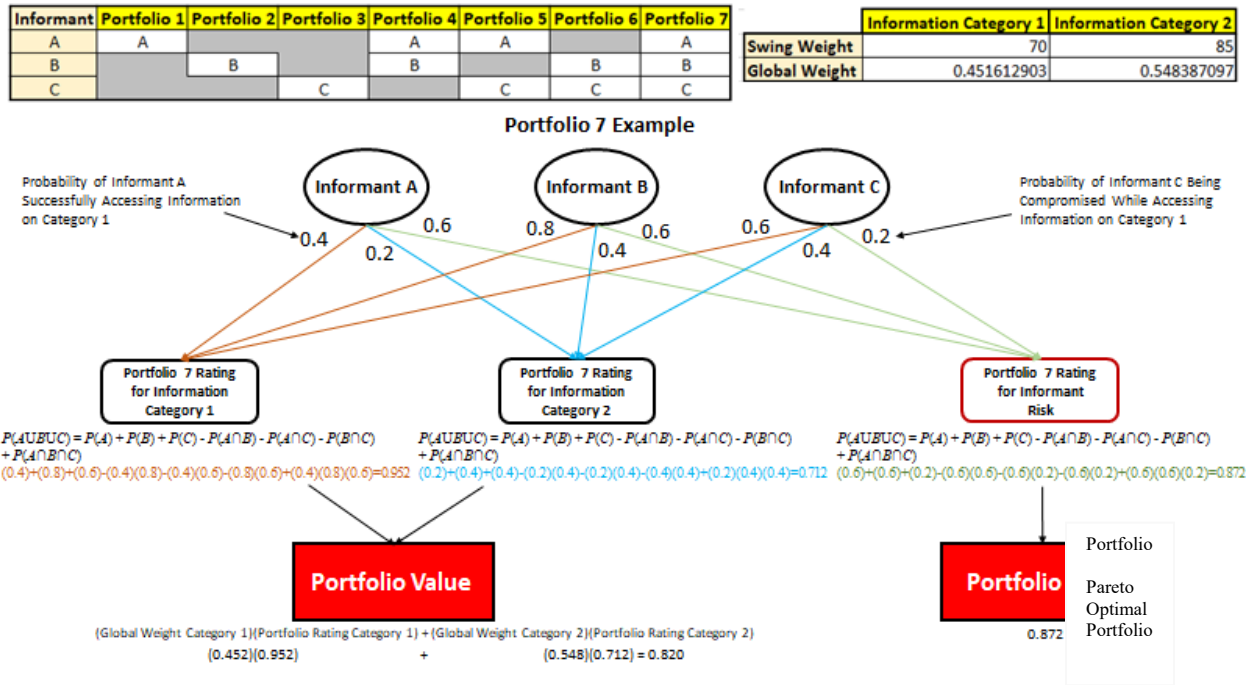


Figure 2. Portfolio Example

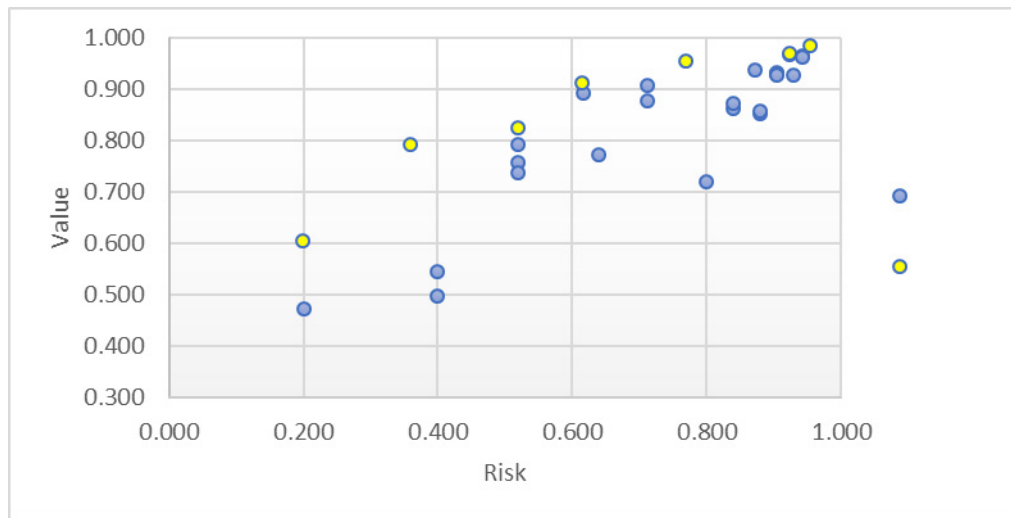


Figure 3. Pareto Optimal Identifier

4. Model Application

The value model is intended to assist in building informant networks for primarily NGOs. NGOs currently struggle to evaluate where to allocate limited time and resources to investigate sex trafficking networks given their primary role of victim recovery and rehabilitation. The value model allows its user to choose from over 32,000 possible portfolio combinations of 15 informants. The vast number of combinations will allow the user to adjust which informants they include

in their portfolio, which will, in turn, allow them to collect the information necessary to help local authorities investigate and prosecute sex trafficking networks.

The value model will be especially useful for new areas of operation. NGOs have limited understanding of the operational environment within new areas. This model can help organizations quickly identify their information gaps and work with local investigators to find individuals who might be able to provide this necessary information. As this occurs, NGOs can begin drafting portfolios of potential informants. The value model can then be used to evaluate these informants' likelihood of success. This will enable the user to allocate resources such as time, money, and energy appropriately. Appropriate allocation of these resources will enable NGOs to focus their efforts towards the informants that have the highest potential to fill information gaps within the operational environment, thus facilitating a greater understanding of the area of operations. The inputs of the model can be updated as operational needs change, and new informants are identified. This flexibility allows the value model to have a longer utility. Inherent in this flexibility is the model's ability to receive complementary data and shift as the NGO deems necessary.

The model can be distributed to multiple NGOs to maximize its effectiveness. The mathematical functions of the model are set, and the model will come with information categories specific to an area of operation. Other NGOs can adjust these categories to better suit what gaps they may have specific to their areas. The model is merely a tool to evaluate informant portfolios' likelihood of success, rather than to prescribe courses of execution. Like any tool, the model cannot be expected to solve such a complex problem as human sex trafficking.

5. Conclusion

Both governmental and nongovernmental organizations work to eradicate sex trafficking. Sex trafficking in some states, however, is more culturally accepted. When governments are apathetic towards the issue, NGOs must assume a more significant burden of combating sex trafficking. This means the NGO now has the role of investigation through rehabilitation, which introduces problems from jurisdiction to resourcing. With every new problem, the efficiency and effectiveness of the organization are reduced. NGOs must establish informants, hire investigators, raise additional funding and most importantly, they must institute a system of working with local authorities that have jurisdiction and the power to prosecute. The operational environment dictates all these responsibilities. The operational needs identify the information gaps that the NGOs need to fill those gaps better.

Our model may prove useful to many organizations that depend on informants for intelligence because it will improve their ability to evaluate the information collected. Therefore, improving the understanding of the operational environment in the process. Most significantly, the model's versatility facilitates users being able to mold the tool to help evaluate their specific organizations' unique problem sets.

6. References

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