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THE ROLE OF SOCIAL ENGINEERING IN THE ENERGY BALANCE OF SYSTEMS

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ABSTRACT

A big problem of our time is the constant increase in the energy used. An efficient energy household is one possible solution. Increasing efficiency requires examining the energy balance. System disturbance is one of the factors influencing the energy balance of systems. Social Engineering is a form of system disruption that manifests itself in covert and conscious system control. The present study examines the harmful energy role of Social Engineering through the parallels between the regulatory circuit of control theory and the operating model of Social Engineering. The result of the study highlights the importance of cyber defense.

KEYWORDS

social engineering, cybernetic loop, energy model, energy importance, energy balance

CLASSIFICATIONS

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JEL: O13, Q43
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INTRODUCTION

Today, the main goal of systems examining is to ensure sustainability. The development of the industry has unfortunately led to the depletion of fossil resources. The use of climate-neutral resources is extremely emphasized in modern systems. Furthermore, increasing efficiency has become an inevitable topic. The smart city concept is one of the products of the need for long-term sustainability [1-6].

Investigation of energy systems is an aspect of efficiency. The two main aspects of energy analysis are the study of the system's own energy balance and the study of the energy effect of the factors interfering with the system [7-9]. Factors that interfere with the system can be accidental effects or targeted effects. The latter disruptive effects include Social Engineering [10-12].

The present study examines the role of Social Engineering in the energy balance of the system. The operating mechanism of Social Engineering can be mapped to the operating model of cybernetic loop [10, 12]. Therefore, the study uses the cybernetic loop model used in control theory and the energy balance model of the systems [8-10] to model the effect of controlled disturbances.

The paralell between cybernetic loop and Social engineering is mentioned during the study. This allows the two models to be connected. Examining such aspects of systems calls attention to the protection of energy systems. Preventing the negative effects of Social Engineering not only increases information security [13-19] but also increases energy efficiency.

ENERGY BALANCE

The modeling of the energy balance of systems is worth placing on a philosophical basis. Philosophy is the ancestor of all sciences, so there is less chance of creating an incomplete model. The model serves to produce a theoretical abstraction of reality. Therefore, the initial idea of the model is based on abstract categories of human thinking [8, 9].

One can, in the abstraction of reality, classify everything into the following three categories:

- thing – an expression of some functionality. The energetic equivalent of this is *transformation*,
- property – which determines the operation. The energetic equivalent of this is *storing*,
- relation – which determines how things relate to each other. The energetic equivalent of this is *transmission*.

Elements of the model also fall into these three categories during modeling. The systems are made up of components that implement energy transmission, energy processing and energy storage. The result of the energy modeling is the following equation:

$$E_{\text{in}} = \Delta E_{\text{store}} + E_{\text{out}}. \quad (1)$$

Equation (1) describes that the energy reaching the system covers the energy stored in the system and leaving the system [8, 9]. Figure 1 shows the theory of modeling.

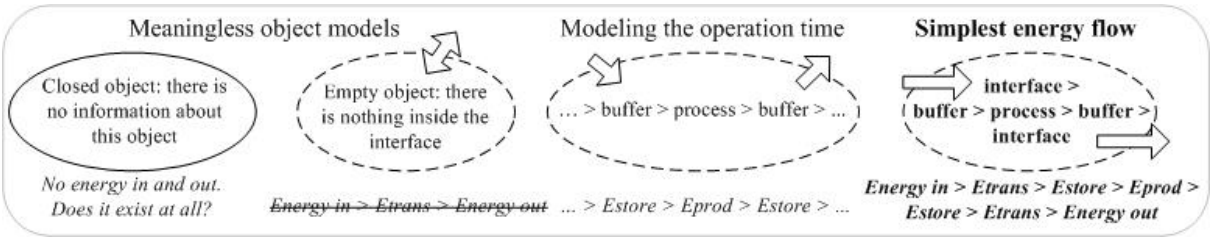

Figure 1. Energy modeling [8].

SOCIAL ENGINEERING

The function of the cybernetic loop is to ensure the temporal operation of the system. This mechanism allows system maintainers to adjust the operation of the system as needed. In

addition to functionality, the goal of most systems is sustainability. This is ensured by the control system [20-26].

System interference is included in the system cybernetic loop model. This interference affects the processes of the system. The disturbance can be of natural origin and can be initiated by the human mind. The disturbance initiated by the human mind is usually hidden and is not intended to sustain the system in the long run. Such covertly directed disturbance serves an unknown purpose for system maintainers by exploiting system resources. This phenomenon is called Social Engineering [10, 12].

In terms of the mechanism of action of Social Engineering, it operates on the same principle as the model of cybernetic loop. The three phases of the Social Engineering process are information gathering, processing and preparation, and intervention. These correspond to the three phases of the cybernetic loop [12]. Figure 2 shows the parallels between the two models.

Based on what has been described, Social Engineering can be considered as a hidden control mechanism. The combined operating model of Social Engineering and the cybernetic loop was developed [12]. Figure 3 shows this model.

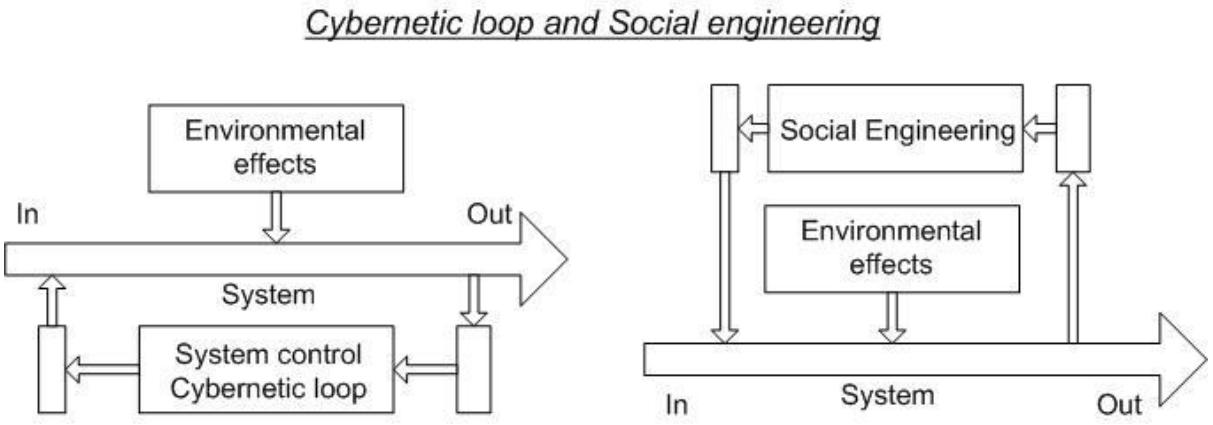

Figure 2. The parallel between the cybernetic loop and social engineering [12].

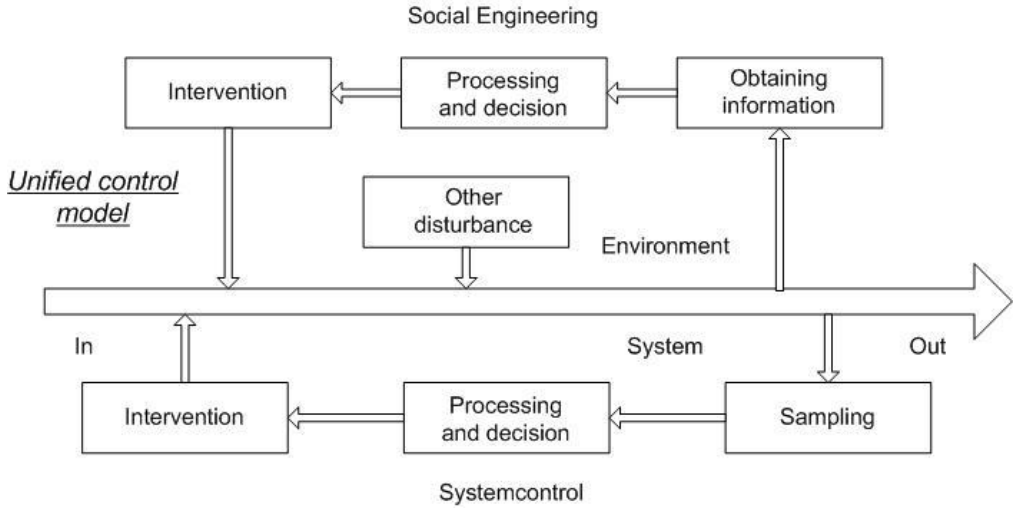

Figure 3. Unified model of cybernetic loop and social engineering [12].

ENERGETIC IMPACT

The energy impact of Social engineering can be modeled using the combined model of the cybernetic loop and Social Engineering and the energy balance model of the systems.

Using the traditional model of disturbance in the system, the energy balance of the system is described by equation (1). That is, the amount of energy reaching the system is equal to the sum of the change in stored energy and the amount of radiated energy.

Using the unified model, one can write the fpllowing equation:

$$E_{in}' = \Delta E_{store}' + E_{out} + E_{SocEng}. \quad (2)$$

Combining:

$$E_{SocEng} = [E_{in}' - E_{in}] - [\Delta E_{store}' - \Delta E_{store}]. \quad (3)$$

From (3) it can be red that the energy entering and stored in the system must balance the impact of social engineering.

Comparing the two cases: achieving the same amount of useful work requires more energy investment in the presence of social engineering. Respectively, in the case of the same energy investment, the system's reserves are reduced. Both effects worsen the energy balance. Therefore, it is not only worthwhile to protect the system from the effects of Social Engineering in terms of information security, but also to protect it from an energetic point of view.

SUMMARY

The main challenge for current systems is to ensure long-term sustainability. To this end, new sustainability concepts are being developed. Such concepts include Industry 4.0 and the smart city concept. Implementing new concepts requires identifying and addressing sustainability issues. Efficient energy management is one possible solution to the problems of sustainability.

One way to examine energy management is to review the energy balance of the system. The general energy balance equation is derived from the modeling of the energy balance. Improving energy balance can be achieved by improving the control system. Disturbances of the system can be both random and directed. Social engineering is one such directed disturbance. Due to its mechanism of action, Social Engineering can be paralleled with cybernetic loop. This is how the unified operating model of the cybernetic loop and Social Engineering was created.

The present study examines the energetic role of directed perturbation using the unified cybernetic model and the energy balance model of systems. According to the results of the modeling, the energy entering and stored in the system must balance the impact of social engineering. This induces the conclusion that protecting the system against Social Engineering can reduce unnecessary energy consumption. This promotes sustainability.

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