

A method for reducing the impact of information risks on a megaproject life cycle based on a semantic information field

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Introduction

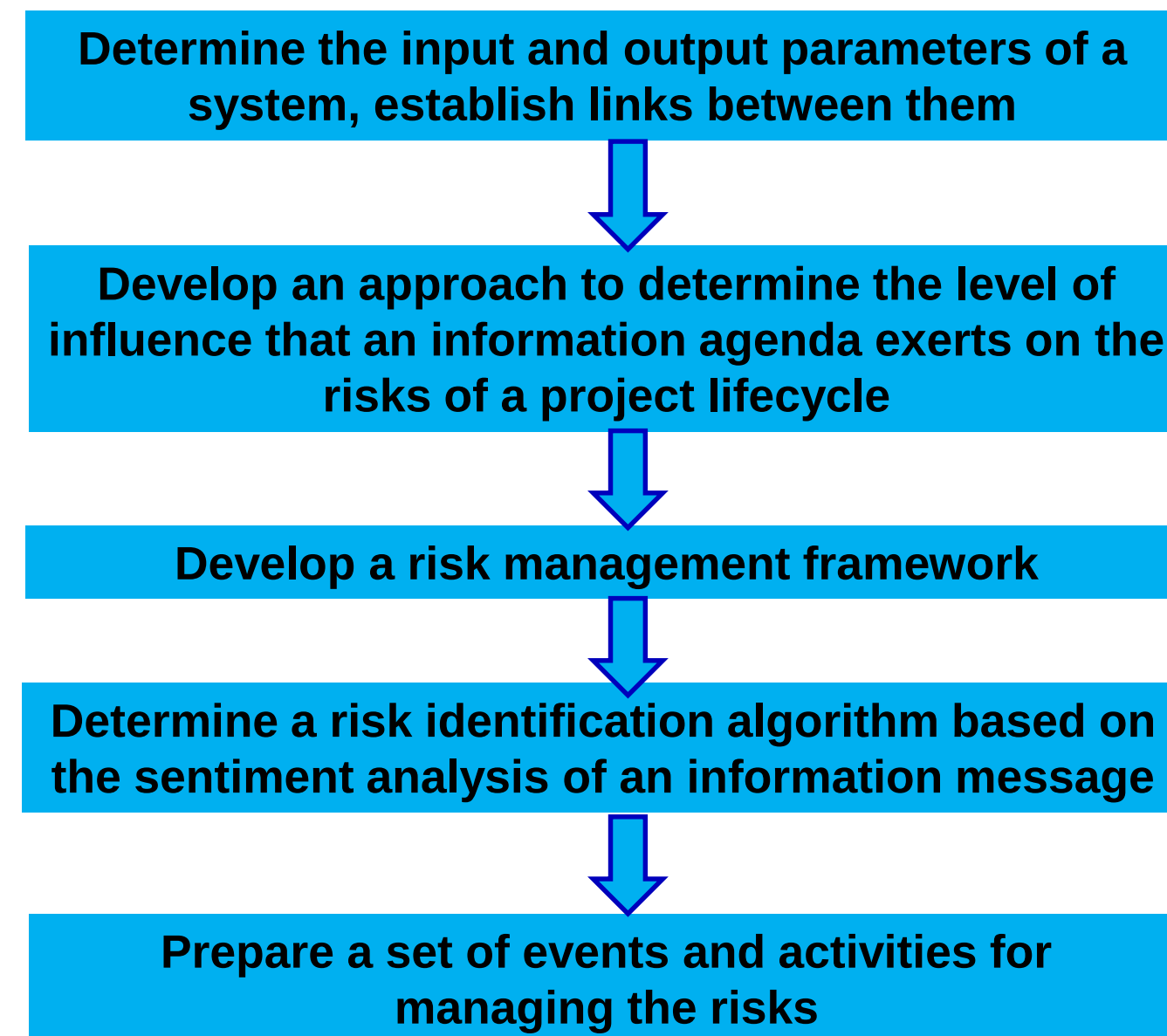
•The decision to launch an international megaproject involves consideration of multiple risks, such as long implementation period, large financial investment and its significantly delayed return, international image and reputation of a Country and a Corporation involved, and the use of foreign territories.

•Generally, major types of risks associated with international projects are country-related, legal, technological, competitive, financial, market and information related and force majeure.

The impact of these risks on a project can be significantly reduced by developing and implementing a loyalty program for international megaprojects

Managing the Semantic Information Field of a Megaproject

In order to build a solution management model, the following steps must be implemented



Developing a Risk Management Framework

Before selected events and activities are carried out, there is an initial set of data on risk indices

$R_{inf} = \{r_1, r_2, \dots, r_i\}$, on the basis of which, a system generates necessary set of events and activities according to the formula:

$$A = (a_1, a_2, \dots, a_p)$$

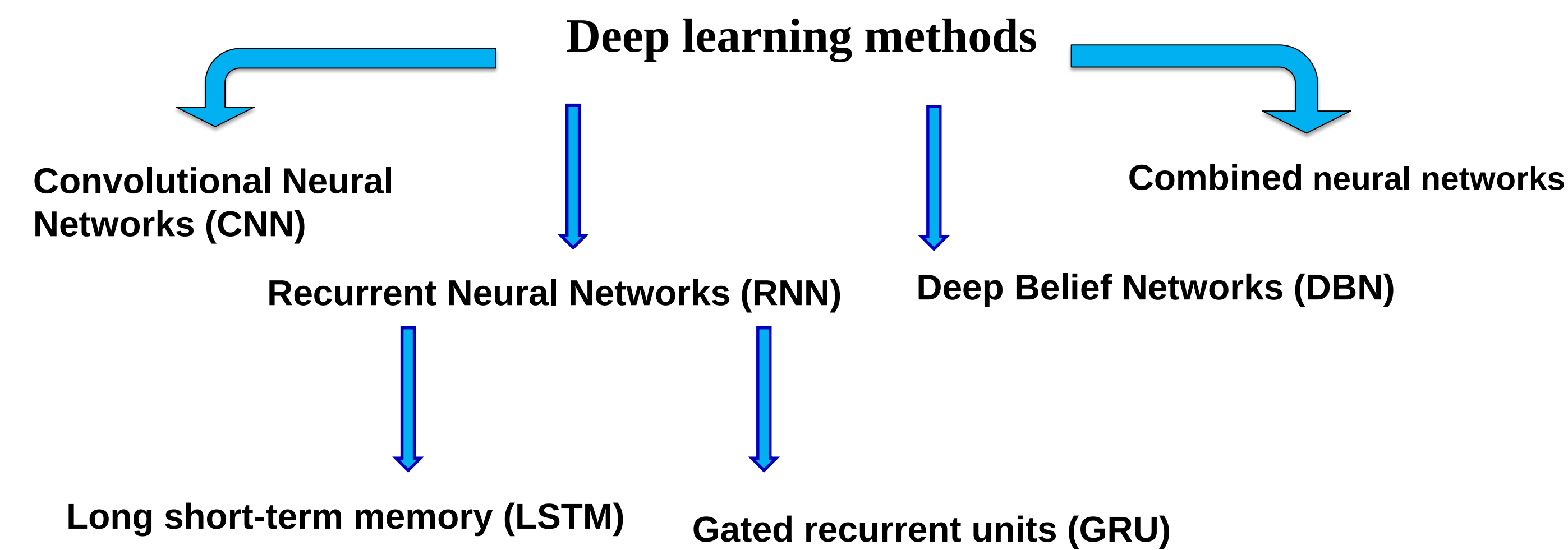
Events and activities generation system forms a vector of management actions:

$$L = (f_0, a, A)$$

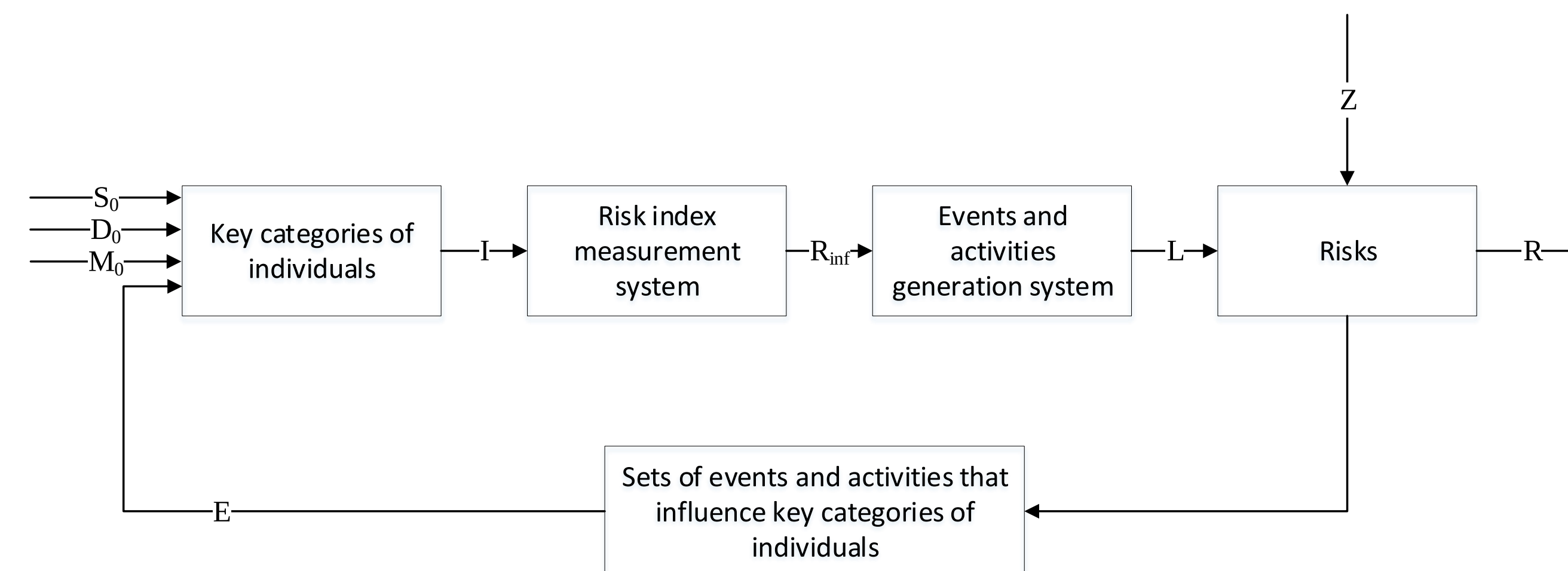
Based on the results from the implementation of the set of events and activities used to influence key categories of individuals, the final vector is formed

$$E = (R, L, Z)$$

Sentiment Analysis Based Algorithms for the Identification of Risks



Information risk management framework for an NPP construction.

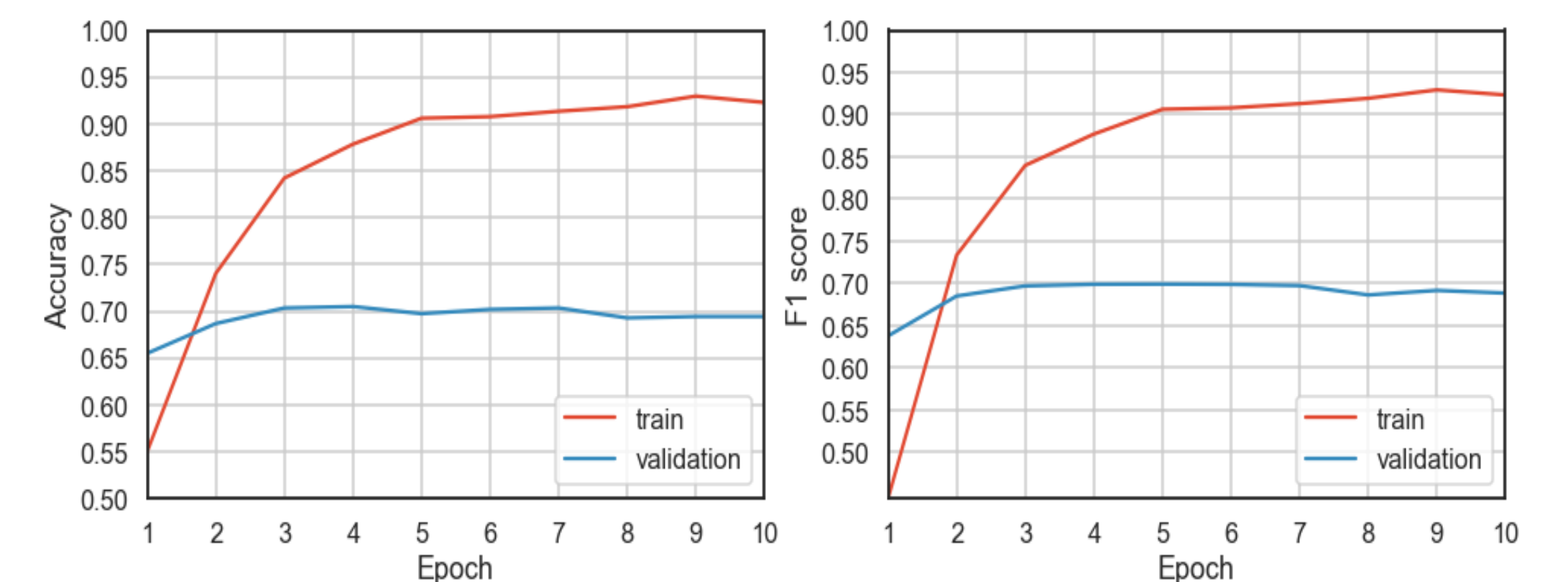


The model of risk management at particular stages of an NPP life cycle

$$F = \{f_0, a, A, R, L, Z\}$$

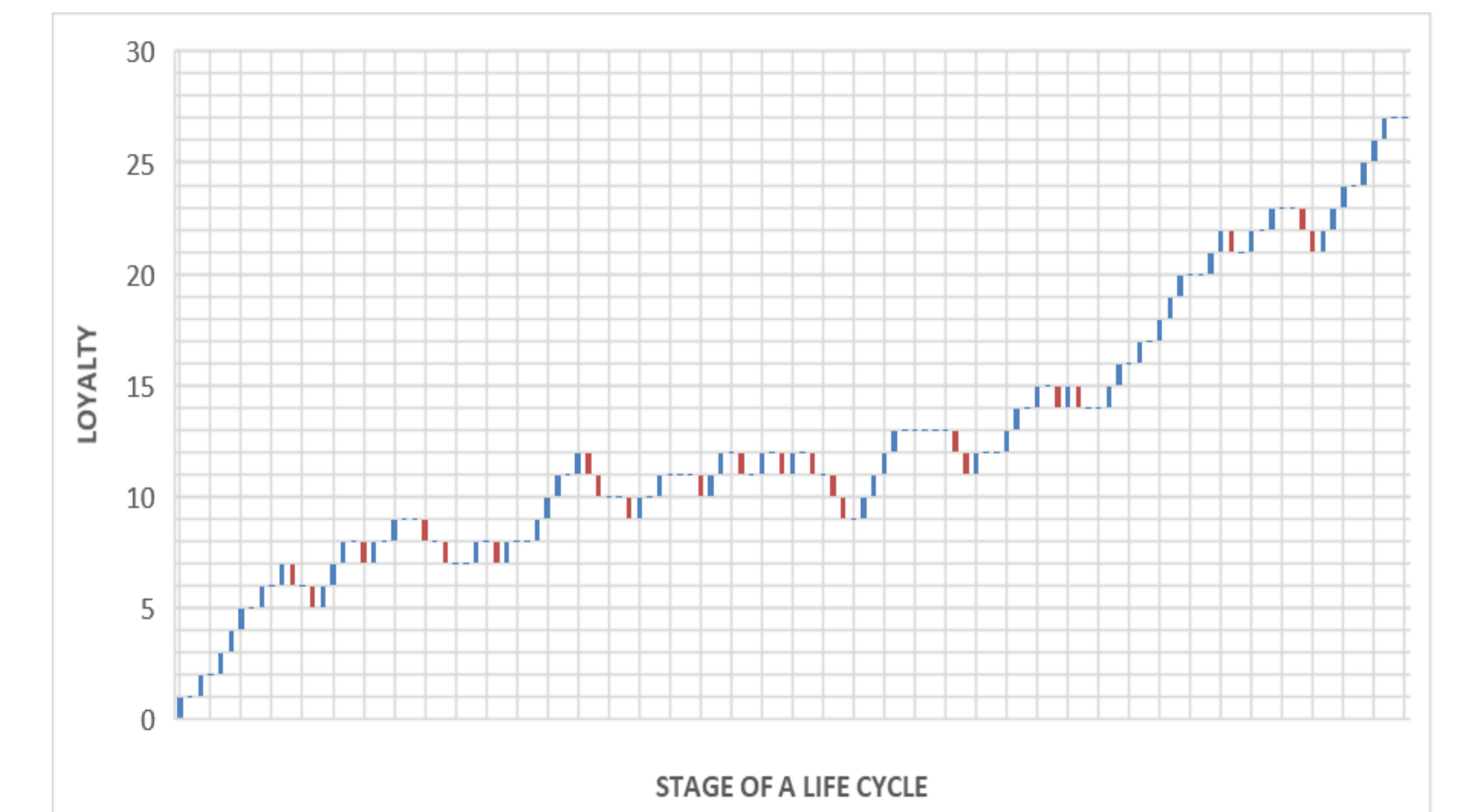
Results

Quality of neural network (CNN) in terms of accuracy and F1 score



The quality of the algorithm is 70% accurate in classifying text data into three classes. The proposed model can be used as a part of general method to identify semantic information field management framework with uniform software and hardware solutions.

Level of loyalty by the stages of a life cycle



When there is a downward trend in the level of loyalty, a set of measures can be formed to smooth or compensate for the resulting effect.

Blue color indicates an increase in level of loyalty, and the **red color** indicates its decline.

Conclusion

Preliminary studies have demonstrated the prospects of using the proposed method; and, using a deep learning model for the sentiment analysis shows high accuracy.

Next steps in the development of the foregoing method are to improve the neural network model (to enable it work with Russian-language text data) and to test this model on data sets of other languages.

Finally, in order to collect and store data from key categories of individuals in real or close to real time, specialized software and hardware solutions must be implemented.

Risks of NPP construction

Within the framework of an NPP construction project, the risks can be divided into three groups:

- project risk
- systematic risk
- the risk of external influence (R_{ei}):
 - ✓ force majeure (R_{fm})
 - ✓ the information risk (R_{inf})

The value of each risk index ranges from 0 to 1, depending on the developmental stages of a project. Further, using the same method of expert assessments, the relative weights of these indices W are determined.

$$R_{ei} = R_{fm} * W_{fm} + R_{inf} * W_{inf}, \quad W_{fm} + W_{inf} = 1$$

The term "information risk" should be considered in the context of informational flow that is generated not only inside but also outside the system.

Information risk

Stages of a LC	Risk	Probability
1. Concept	Adverse socio-political situation	0,2
2. Design	Public impact on project implementation	0,4
3. Construction and commissioning	Decline in Corporation image as a vendor of nuclear technologies.	0,1
	Public impact on project implementation	0,4
4. Operation and maintenance	Decline in Corporation image as a vendor of nuclear technologies.	0,1
	Public impact on project implementation	0,2
5. Handling of SNF and RW	–	–
6. Decommission	Decline in Corporation image as a vendor of nuclear technologies.	0,1
	Public impact on project implementation	0,1
7. Severe accident management	Decline in Corporation image as a vendor of nuclear technologies.	0,9

Defining Input and Output Parameters

Vector of initial information about an NPP construction stage – input parameters

$$f_0 = f(S_0, D_0, M_0)$$

S - terms of cooperation

D - concluded agreements

M - international cooperation

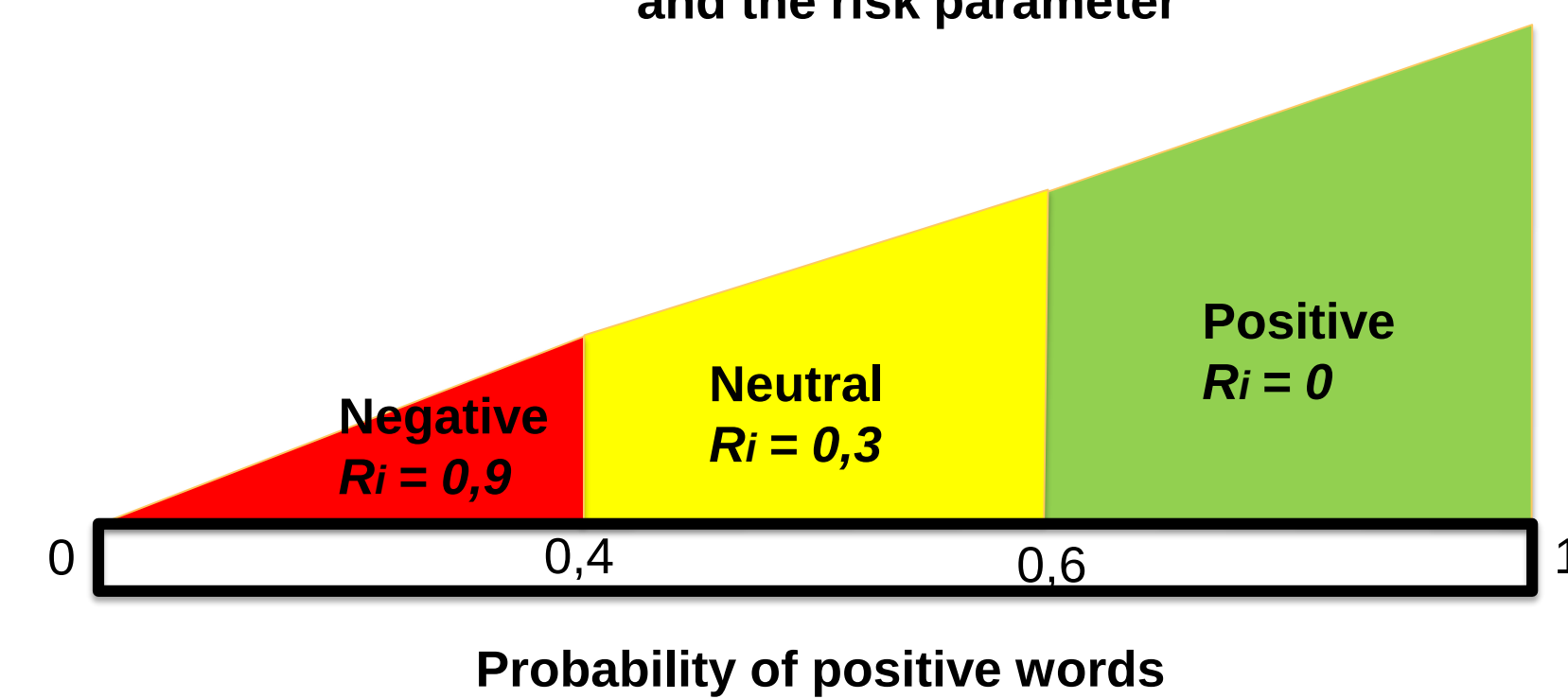
As the sets of events and activities that influence key categories of individuals are performed, the changes can be described in a function of transition from primary (initial) information to a current state of informational flow

$$\alpha = \alpha(S, D, M)$$

The result is the output parameter R , which represents a set of risk indicators for the completion of a particular stage of NPP construction.

Development of the Risk Index

Scale of correspondence between the message sentiment and the risk parameter



Project information risk index

$$R_{inf} = \sum_{i=1}^N \frac{R_i}{N}, \quad N > 1$$