

About the digital ecosystem project to create a virtual market for digital twins of electrical industry enterprise

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In the context of the growing complexity and uncertainty of the modern economy, the industry of complete sets of electrical equipment has seen a significant decline in profits and increased competition between enterprises.

In some cases, none of the enterprises in the market of complete sets of electrical equipment is often able to fully fulfill a large order from Gazprom or LUKOIL (for example, for the supply of complete electrical substations), which requires a wide range of purchased and manufactured products. The new complex task that arises is to automate the process of forming chains of cooperation of such enterprises, which would be carried out in real time at the very moment of forming a request from a large customer, taking into account the current load, competencies, resource capacities and limitations of each enterprise and the possibilities of their cooperation.

In this manual mode of such negotiations is extremely complex and timeconsuming – each company will need to keep a large staff of experts to know the current status and plans of the company, to check the availability of components in the warehouse or the cost and time for their order on the party, planning the production process with the features of products, processes, tools and competences of workers of the enterprise and to respond through the formation of technical and commercial proposals on each request, which can come a dozen a day from different customers.

However, the most difficult part of this process is to analyze the received proposals on customer side, to understand which of the enterprises can enter the formed chain and in which part of the manufactured product, which will be most profitable for both the customer and other participants in the chain, and where each performer should compromise and give up, at the expense of the profit that he will receive from the accepted part. An important incentive to participate in such cooperation can be the principles of "solidary economy", which, if the chain is formed and the consolidated proposal is adopted, from the resulting profits will allow to compensate concessions to those enterprises who agreed to reduce the price or refuse part of their supply in favor of the interests of the chain as a whole.

This approach can contribute to the development of new approaches in the 5.0 Industry in terms of implementing artificial intelligence (AI) systems that participate in such requests from both the customer and the potential performer, digitizing knowledge, and creating digital eco-systems for colonies of AI systems ("systems of systems"). As well as the principles of Society 5.0, based on the introduction of this kind of digital AI systems, in terms of the "coopetition" model: "cooperation" and "competition", i.e. dynamic switching from competition to cooperation, and Vice versa, depending on the current situation.

As a result of the proposed approach, a digital ecosystem of smart digital twins of various enterprises will be built for the first time, organized as a "system of systems" with p2p interaction of individual systems on a common digital platform.

The implementation results in solving the complex task of ensuring deliveries for complex requests, increasing the flexibility and efficiency of resource management, reducing the time for decision-making by 100-100 times, transparency and reducing dependence on the human factor, and the ability to scale the business without increasing the number of administrative staff.

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