A system dynamics model to investigate the mismanagement share of sanction effects on Iran's oil and gas projects: A case study of South Pars field

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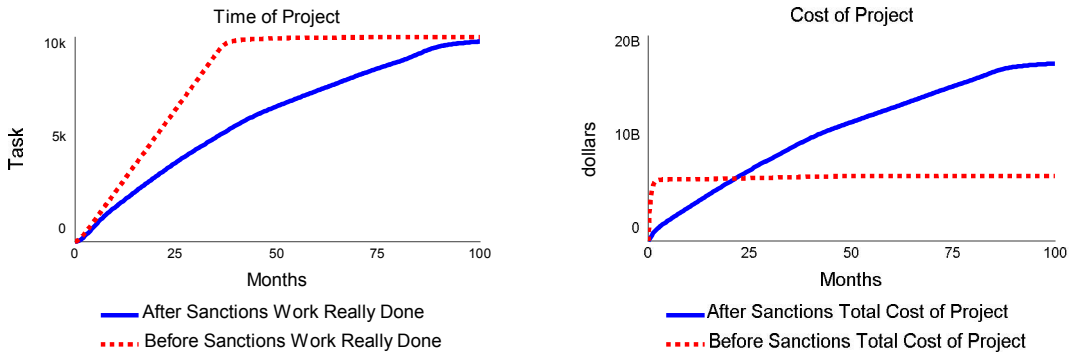
In Iran's oil and gas industry, there are two cases which have long been open to dispute between two main political parties of Iran (Left and Right parties); "Crescent Contract" and "South Pars Project". In the South Pars project the contractor (Khatam) claims that the main reason for its **huge cost and time overruns** had been sanctions and "he has done everything to manage this problem properly". Yet, Iran's Oil Ministry (employer) asserts that a high percentage of these overruns had been due to "**mismanagement**", not sanctions.



Before Sactions: **36.6 months**
After Sanctions: **95.6 months**

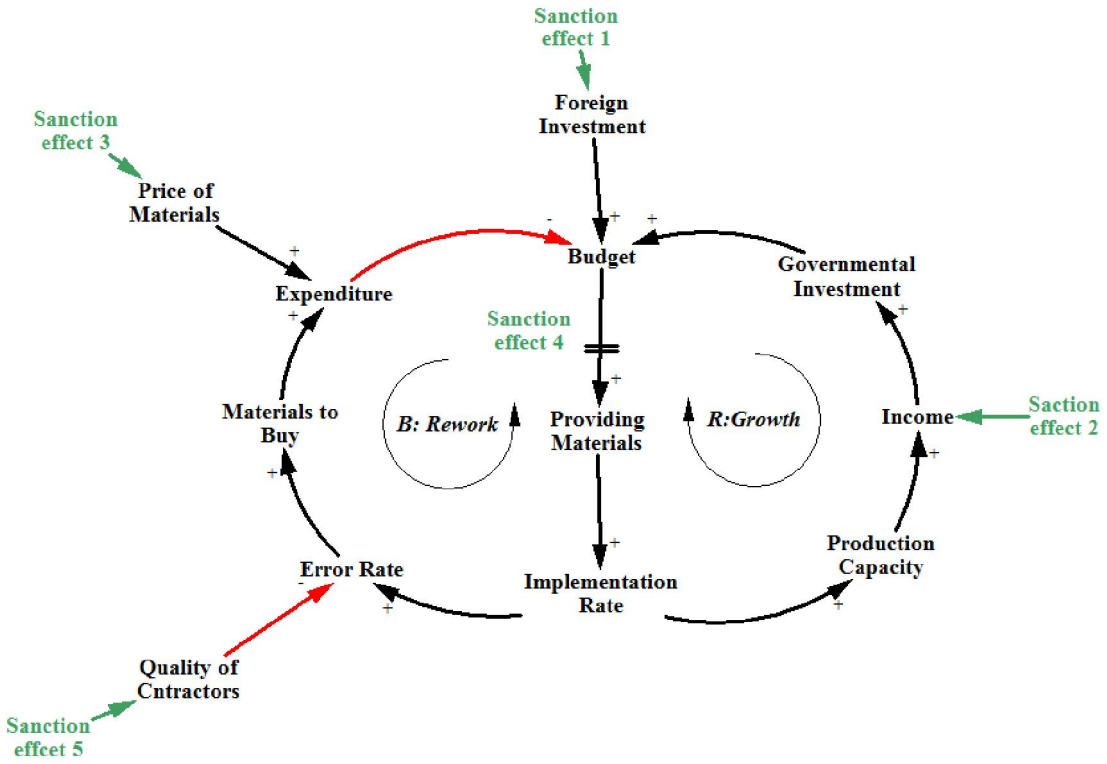
Before Sactions: **6.37B $**
After Sanctions: **17.3B $**

Cost & Time Overruns in South Pars Project

Assuming that this case would be examined in a hypothetical court, we develop a system dynamics simulation model to explore how much could mismanagement really have affected project performance.

The basis of the model is **Ken Cooper's** "rework cycle" model, and the model is composed of two main loops; the reinforcing loop of growth and the balancing loop of rework. In normal conditions, the government allocates some percentage of oil income to invest oil & gas projects and increase production capacity. Indeed, the more oil income means the more governmental investment and budget, & the more budget leads to providing needed materials more on time and the faster implementation rate, breeding the more production capacity & income (**Growth Reinforcing Loop**). Yet, Sanctions affect the projects in five ways: (1)interrupting foreign Investment (2) decrease in

incomes of export oil and gas (3) having to procure technology, materials and equipment more expensive (4) increasing delay in providing row materials & (5)depriving Iran from prime foreign contractors: none of experienced well-known contractors and companies like Total and Shell no longer continued their cooperation with Iran, so inexperienced inner contractors took their place, which lead to a lot of reworking rooted in lack of knowledge and "mismanagement. (It is worth mentioning that we assume that the contractor has no problem with hiring enough qualified staff, and its main challenge is procuring materials, equipment, and technology. Indeed, in most cases, Iran has not enough capability in developing required technologies and it is forced to import these technologies and materials. So, after sanctions, inner contractors faced serious problems regarding procurement. Lack of needed materials and technologies slowed down the progress of the projects, and contractors had to buy them several times more expensive, from black market, with a long delay for finding suppliers.)



In short, sanctions weaken the reinforcing loop of production capacity, by increasing delay in "providing materials", and by decreasing "income" and "budget". On the other hand, the balancing loop of reworking undermines the mentioned positive loop as well; after implementation it will appear that some percentage of done works are lake of enough quality and need reworking, the more error rate means the more material should be bought, which in turn, increase expenditure of project and put more pressure on budget. Finally, after modeling and simulating the case we found that the claim of Iran's Oil Ministry is true and mismanagement could have caused about 3.6 billon dollar and 30 months overruns.

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