How the world most underdeveloped nations get the world's most dangerous weapons.

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In 1954, Iraq's industrial economy consisted mainly of 'factories' employing one or two workers. With only fifty-five Iraqi engineering students graduating that year, there was no reason to believe that this situation would change anytime soon. But in twenty years the Iraqis were laying the foundation for a massive chemical-weapons industry, setting up a nuclear program that would eventually grow into a $10 billion effort, and welding together a long-range missile program with dreams of launching satellites into orbit. Nor was Iraq the only underdeveloped country acquiring such advanced- and secret – technologies. This essay tries to explain how this could happen.

Proliferation

Nations can acquire weapons of mass destruction (WMD) in several ways. A state highly dependent on foreign expertise could try to **buy a complete WMD** production facility, that consist of designing and building the plant, equipping it and training the workers to run it. The training of the workers is very important for the proliferator's future success; just buying equipment is not enough.
A proliferator highly independent on foreign expertise will go through the steps that an **innovative** civilian manufacturer would: develop a concept for the weapon, work out the design problems through engineering prototyping, and solve any problems associated with production. Even the most advanced countries would prefer to avoid the path of independent innovation for acquiring WMD, presumably more for fear of running into a technological dead end than out of corruption, which played a substantial role in developing countries.
Somewhere in between these tow acquisition paths falls **reverse engineering**. A proliferator following this path buys, begs, borrows, or steals a weapon system, takes it apart to understand how it works, and duplicates it. Reverse engineering can be recommended to potential proliferators, because design and engineering can account for a third to a half of the development time and recourses for a weapon system. However, the proliferator must still go through production prototype and scale up, which can be difficult for an underdeveloped country.

Secrecy of WMD programs

Secrecy surrounding a proliferator's own weapons program may have its own adverse effects. One of the risks the independent innovator faces because of this secrecy is failure to develop a useable weapon, which could be prevented by sharing his ideas. Then policy makers can learn more form what other countries are doing, normal scientific peer review is possible.

Problems with reverse engineering

Once a proliferator has imported a missile or centrifuge or whatever, still a lot of problems will arise in reverse engineering. A good example for this is the Iraqis who tried to reengineer the SCUD missiles. For the war against Iran they wanted to make the SCUD missile travel farther. By trying this, they faced a lot of problems and eventually stopped the project. This example shows how difficult reverse engineering is and that it might not be as effective as it might at first seem.

Acquiring plants for the production of chemical and biological weapons- Iraq example

The Iraqis not only were interested in missiles, but also in chemical and biological weapons. The development paths of these weapons follow the same pattern as that of the missiles.
The Iraqis start thinking about producing nerve gas (VX) when the British patent office approved and published the formula and method of synthesis for a whole family of organophosphate chemicals. Originally the chemicals were intended to be used as pesticides, one such a pesticide, amiton, bears a striking similarity to VX . To be able to produce VX, Iraq proposed Pfaudler (manufacturer of chemical processing equipment) to build a production facility capable of producing 1200 tons of pesticides annually. Even without outside experts building it, such a plant would require considerable skills and specialized knowledge to run. Pfaudler therefore urged the Iraqis to first construct a smaller pilot facility so that their technicians could learn the production process without the difficulties and dangers inherent in large scale operation. The Iraqis refused this, and Pfaudler proceeded with the engineering and design work. After a while Pfaudler could no longer accept the risks to Iraqi technicians and backed out of the deal. Iraq, however, retained the specifications that Pfaudler had drawn up in the course of the year. They tried another manufacturer of chemicals, but this company didn't want to get involved. These first failures to purchase outright an industrial- scale plant that might be easily modified to produce VX did not discourage the Iraqis. Eventually they found a partner in the German firm Karl Kolb, which would go on to design and supervise the construction of five large research laboratories and the first Iraqi production facilities for tabun and sarin, two important nerve agents. Iraq then duplicated these plant many times and used the skills gained from the foreign advisors to design a plant for producing mustard, the deadly blister agent introduced in World War I.

Equipment is not enough to make WMD

Obtaining the necessary equipment also is not *the* key to make WMD. The example of the Libyan, who tried to convert uranium ore into uranium hexafluoride, the vital substance for enriching uranium to bomb grade, illustrates this. Libya had acquired sufficient theoretical understanding of uranium conversion and the knowledge necessary to specify a production plant, but not the shop-floor knowledge needed to actually run the facility they designed.

Future view on production of WMD; how the prevent this?

From the examples earlier presented follows the complexity associated with obtaining weapons of mass destruction. A would-be-proliferator must not only develop a weapon, but also the tools and machines and skills needed to produce it in volume.
We cannot be to optimistic about this, because there are always profiteers willing to sell the world's most dangerous technologies if the price is high enough. And much of the shop-floor skill and tacit knowledge needed can be gained by honing general manufacturing capabilities. As such beneficial knowledge spreads, it will become much easier for proliferators to find the necessary population of skilled workers already within the country. We do still need our supply-side-oriented nonproliferation regimes to try to prevent crucial technologies form being shipped to countries that might abuse them. But those regimes need to adapt to a world that is rapidly modernizing. There are precision machine shops in a lot of countries that can produce all the components needed for almost every weapon system. Instead of concentrating on preventing the individual pieces of equipment, our nonproliferation regime must take a global view and track worldwide shipments, looking for correlations of suspicious items.