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## Op-eds

### How to engineer better decisions

Decisions are taking place everywhere you look. From something as simple as a traffic signal going red, to turning valves at the local water plant, to production schedules of critical infrastructure like power grids, decisions are being made every second. And in our ever-faster world, those decisions need to be faster, too.

Coordinating and optimising these decisions often requires information to be gathered from places that are far apart. And the human mind can only process so much information in the short time available. Growing costs, and environmental and regulatory pressures make it all the harder.

So we turn to automation and information technology - from controllers on a single digital board, to fully integrated enterprise resource planning systems.

But these are only as good as the algorithms they are programmed with and the degree to which they are integrated together.

Scientists at the Masdar Institute are working on systems that make complex, timely and effective decisions as effortless as possible.

One area we are working in is renewable energy power grids, which more countries are expected to adopt in response to global climate change concerns.

Power grids in general are complex and interactive, which makes them difficult to manage - as the 440 million people affected by five major blackouts from 2003-2011 can testify.

And renewable energy is tricky to handle, as the grid has to accommodate power fluxes from the variable renewable energy sources, most commonly solar and wind.

Power grids can be viewed as having three layers of operation. At the top, there are optimised dispatching algorithms that determine who is going to consume how much, where and when.

In the middle, there are operators at a control level managing and ensuring that the grid stays reliable. Should anything go wrong, they are in control.

The final layer is the physical grid, which has dynamics based on physics and electrical engineering.

For the first time, we are looking at how these three layers fit together, monitoring function and efficiency when large influxes of solar or wind power are added to the grid.

We are asking human operators to look at large sections of geography to make decisions and to make those decisions faster. The question is whether they can be supported to make those decisions effectively without being under too much pressure?

At its most basic level, this should help us find the sweet spot between requirements like efficiency, reliability, cost, carbon neutrality and improved energy savings. When a decision needs to factor in all of those elements together, not just the bottom line, you need to have a plan on how to achieve that.

At the Masdar Institute, we are trying not just to come up with that plan but also a methodology of how it can be accomplished with the various control, automation, and information technology tools available.

We hope to apply what we learn from this to many other problems in the UAE and abroad - cutting supermarkets' power bills, or helping a metals producer reduce waste through smarter manufacturing. In fact, all heavy industries and infrastructure entities could benefit from such interdisciplinary research.

The key is better communication between academia and industry. Industry must ask what academia can do with their analytical problems that the fast-paced nature of day-to-day business does not allow time to address.

And academics should take the time to visit industrial and infrastructure entities, to offer their creative and analytical problem-solving abilities. This dialogue must grow.

When it does, Abu Dhabi and its push towards sustainability can only further benefit as cost, energy needs, and waste are all reduced.

**Dr Amro Farid is an assistant professor of engineering systems and management at the Masdar Institute of Science and Technology.**

<http://www.thenational.ae/news/uae-news/technology/how-to-engineer-better-decisions>  
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