Hypes and failures in OR - some examples

by Florian Jarre
Heinrich Heine Universität Düsseldorf

We all know that our field is governed by hypes and failures – as are many other research fields – but it may help to make onself aware of such developments every now and then.

Scientifically, I was born on a hype. When I took a class with Abraham Charnes in 1984 at UT Austin in Texas, Charnes very angryly enterered the class room one morning, saying this is never going to work, and distributing in my class a copy of the cover story of the NY-Times dedicated to Karmakars algorithm. The interior-point methods initiated by Karmakar back then are what I ended up working on in my dissertation a little later.

But interior-point methods were a hype that pretty much bypassed Germany. Germany has its own hypes. Back then it was combinatorial optimization – due to applications in OR. Today it is big data and AI with all its branches reaching to robotics and other parts of OR, and admittedly this sounds much more exciting than interior-point methods.

AI had been a hype already in the early 1980s but came out of fashion in the mean time. It thus parallels the development of interior point methods which also had been considered much earlier – in the late 1960s – but came out of fashion thereafter. One driving factor in the revived interest in interior point methods in late 1980s and in AI today is the advance of computer technology that allows amounts of computations which were unthinkable 20 years earlier, thus allowing adaptations of old techniques, making them much more exciting than its predecessors.

Hypes do almost always gereate progress in the field, as do failures which of course are much more fun to talk about. So this is what I like to concentrate on briefly:

There is a nice collection of "Software Bugs" by Thomas Huckle at TUM which also contains some failures in OR. Example Nr. 26 in https://www5.in.tum.de/ huckle/bugse.html concerns the opening of the new Denver International Airport initially planned for the end of 1993, and which had been delayed repeatedly due to the failing of computerized baggage Handling.

Of course, as a German it might seem more appropriate to talk about the Berlin Airport, but it seems that the disaster of the opening of the Berlin airport is largely due to incompetence while the opening of the new Denver International Airport does address interesing scientific questions.

The spatial outset of the Denver airport was planned rather generously, with large distances between terminals and runways and thus with a more challenging task of arranging for rapid luggage transfers in between runways and terminals which were up to a mile apart from each other. New concepts were planned, automatically transferring luggage from conveyor belts to faster carts for long distances, automatically dropping luggage from one cart to another one while both carts are running (in parallel to each other) automatically handling oversize luggage – a multitude of tasks in organizing the flow of luggage between many different target points. One of the key problems was that the conveyor belts could only run when empty carts were in place, and empty would only be available when they dropped off their luggage before, and this was only possible if a cascade of other tasks were completed. The overall task was a problem of line balancing, a disciplince that was not mature at the time of the construction of this airport, apart from the fact that even simplified versions of the line balancing problem are NP-complete, and apart from the fact that there are random effects of different loads during different times of the day and different seasons that needed to be anticipated. More than 1000

scenarios would be needed to have a somewhat realistic sampling of possible instances that are to be solved at a given time. Still today, this is an interesting and challenging problem that is discussed also in quite recent publications. In this respect the ambitious goals of the fully automatzed baggage handling certainly promoted research, even when the airport itself had to give up on this goal and revert to a much more labour-intensive system with very limited automated handling of baggage before it finally opened in early 1995.