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PPI

Capital Project Supply Chain Management

Phil Kaminsky • Arman Jabbari

{kaminsky, a.jabbari}@berkeley.edu

Mega-projects:

- 98% are facing cost overruns of more than 30%
- 77% are at least 40% late

❖ McKinsey & Company

Mega-projects in oil and gas industry:

- 64% suffer cost overruns
- 73% are late

❖ E&Y

What is supply chain management? Is there a problem with capital project supply chain management?

Symptom: Too much inventory too soon on site

What is Supply Chain Management?

Supply chain management is a set of approaches utilized to efficiently **integrate** suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed in the right quantities, to the right locations, at the right time, in order to **minimize systemwide costs** while **satisfying service level requirements**.

Acknowledging the existence of problem

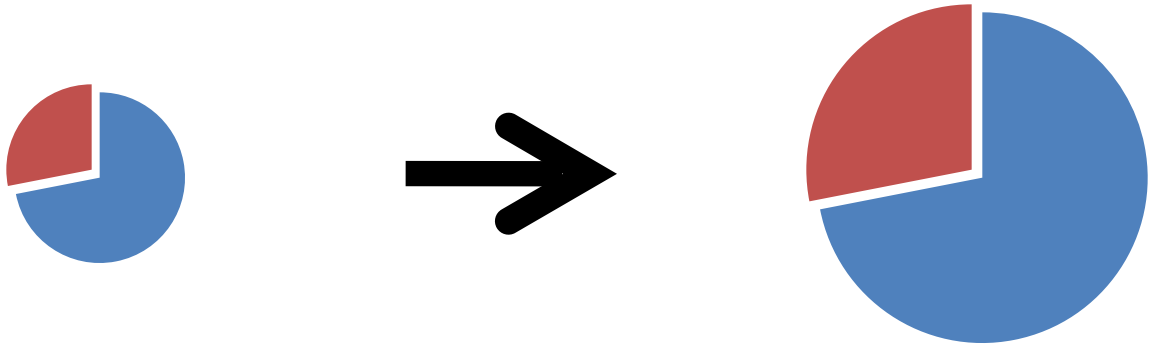
Many of the participants in capital project supply chains believe that the supply is operating close to optimally.

Supply chain performance doesn't seem to support this.

We hypothesize that this mindset is a consequence of, among other things, local or greedy optimization.

The advantages of globally optimizing

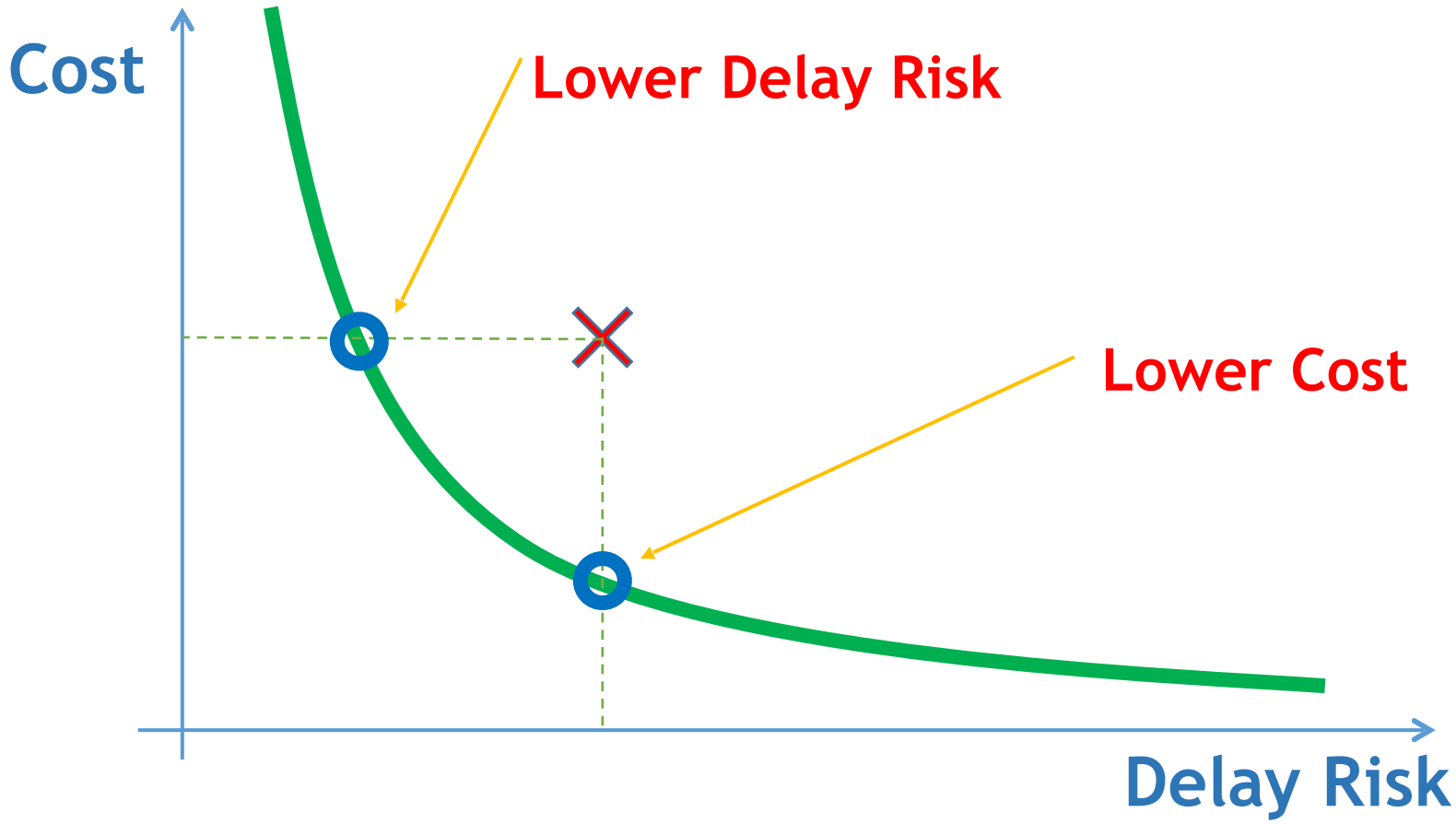
Why?



What is the alternative to global optimization?

How do we measure effectiveness?

Efficient Frontier



Question: Is it true that capital project supply chains operate on or near the so-called "Efficient Frontier"?

Not at all. We are working to change all that as a company.

Also, what we want to do is like the manufacturing world where deliver JIT.

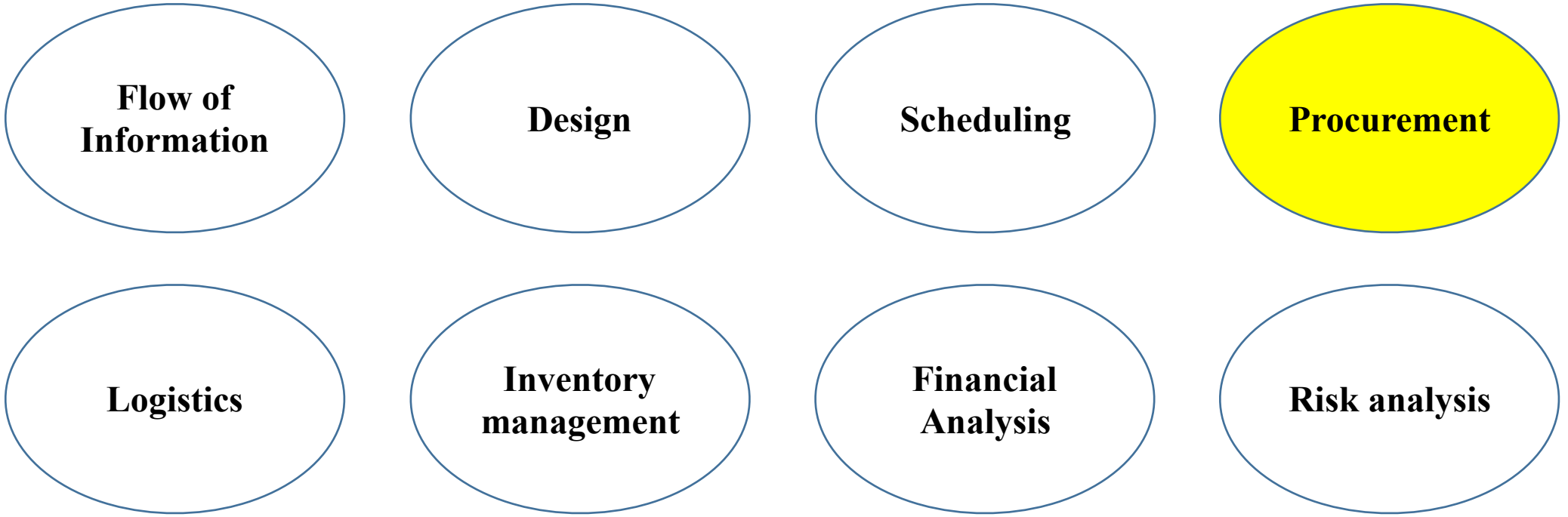
There is probably a smarter way to do it.

I do think that the systems are fairly efficient.

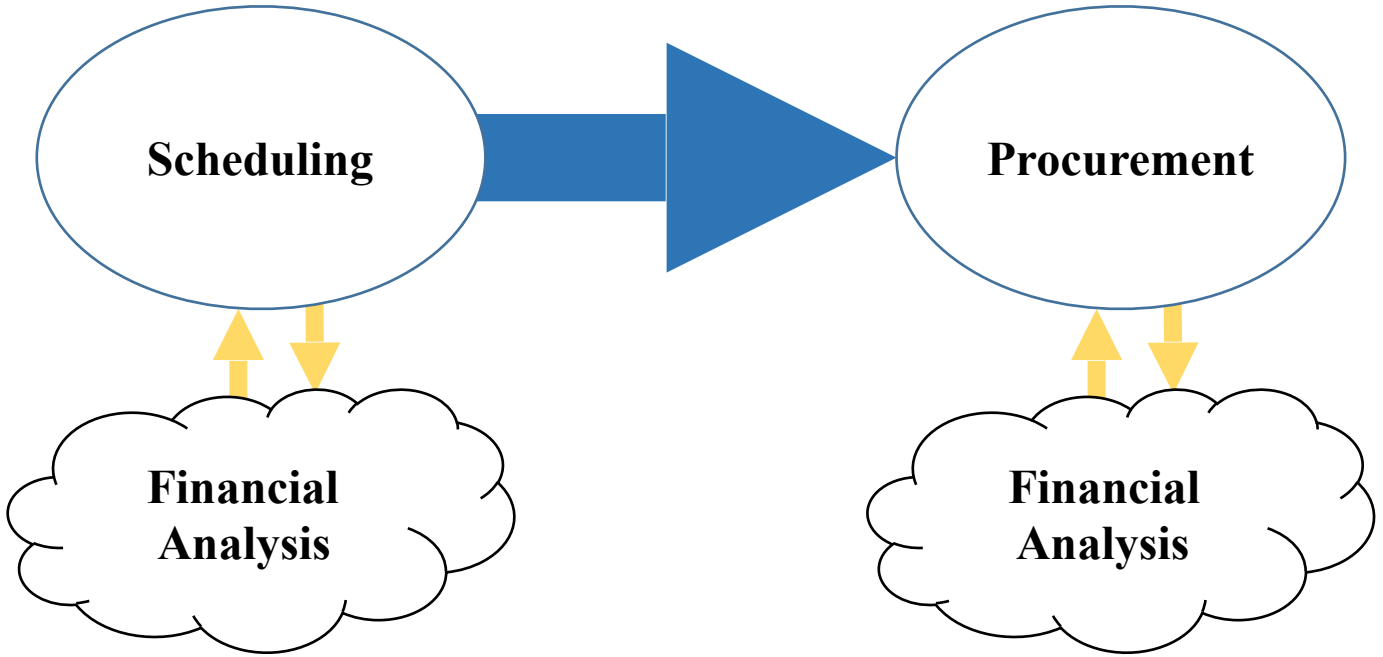
I am not sure that there is a better way.

Supply Chain Management
vs.
Procurement

Supply Chain Management vs. Procurement



Global Optimum vs. Local Optimum



Suppliers and Inventory

How are procurement/supply chain delivery time due dates set?

Depends on the type of equipment and many other thing.

It's not very scientific; it is more of an industry rule of thumb.

How far in advance really depends on the project's need, the project's requirement and the supplier's ability to get the material onsite when the teams need to.

Is it efficient that you ask for delivery significantly before material is required on site?

Although it's not efficient, if we delay a project, that has far more cost than equipment sitting around for 30 days.

There are complex models that are used to develop and sanction projects.

So, I don't think that it's inefficient.

What challenges have suppliers communicated to you?

Suppliers have shared that they would prefer clear communication (straight talk) from ultimate users to eliminate confusion and rework.

Now there is much more open conversation about manufacturing schedules, long-lead ordering, work force, impacts. The suppliers say if you want us to get better, if you want us to be more able did you have what you need when you needed, involve us early enough in your planning cycles so that we can respond and plan practically.

What do suppliers do to guard against changing delivery dates? How does this impact their costs, and the prices they charge?

Most suppliers <u>expect changes to occur</u>. To mitigate their exposure:

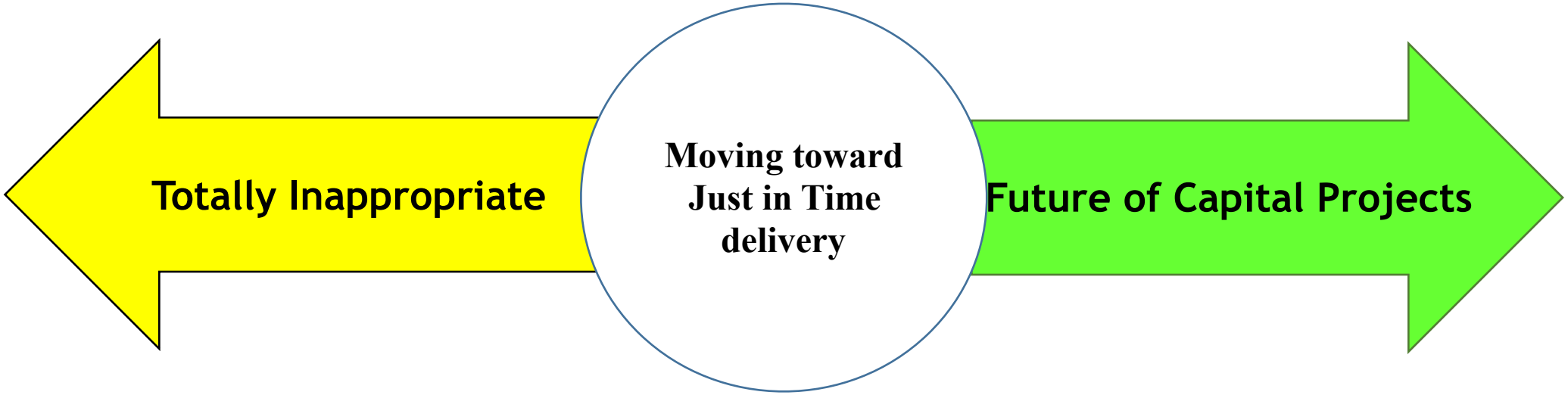
- **They will commonly include cost and schedule contingency in their selling price**
- **Create inventory and or buffer stocks to meet customer demand**

Just-in-time?

What is the reason you company does not use something closer to the manufacturing concept of just-in-time delivery?

- It never works
- There are always changes in construction projects
- Manufacturers usually are late
- We're hoping to move in that direction
- It could work in theory, but there is little transparency between the owner organization or the customer and the supplier organization or contractor.

Alternative Points of View

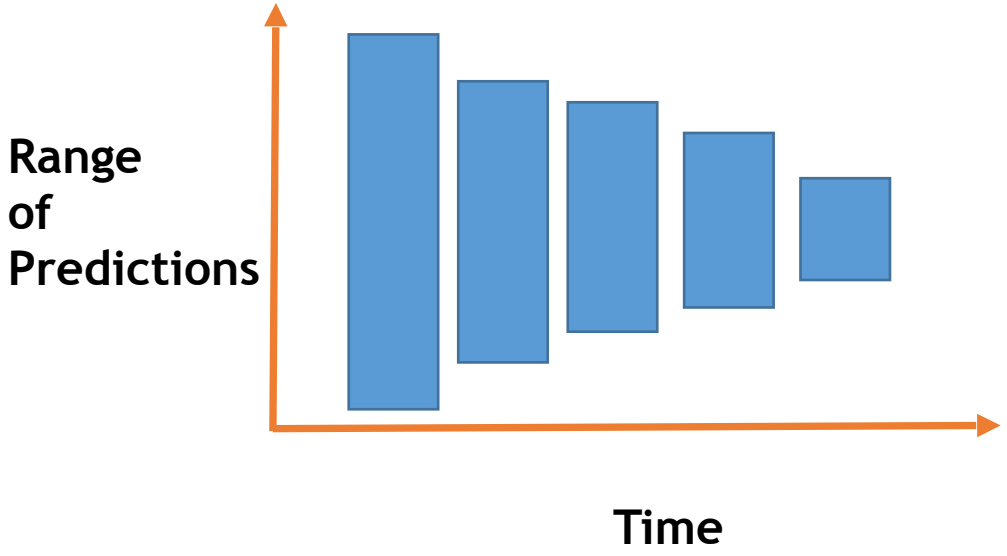


What is the right answer?

Accounting for Dynamic Uncertainty

Uncertainty related to TIME and SCHEDULE

Uncertainty is not STATIC



Robustness

Experience?

How confident are you in your firm's decision-making?

Increases with the experience of the planners

Experience remains with the INDIVIDUALS

The effectiveness increase with the experience of the planners

Intuition-based decision making

The Need for Tools

What tools and techniques do you utilize for analyzing the impacts of delay on overall project performance?

Standard project planning and scheduling techniques…

Companies commonly use scheduling tools

Offshore and large Onshore Infrastructure projects often outsource this activity to trusted EPC or EPIC contractors who create project schedules to track key deliverables and milestones.

You kind of have to do some work outside of scheduling tools using Excel or Arena Modeling Tool and then use that data in your modeling tool…

How reliable are the tools and techniques? Can you describe projects where these tools and techniques have improved project reliability?

We meet 50% of our project schedules, however my own view is the schedules that are met are not world class and tend to be longer than the competition.

In my experience, the tools themselves are generally reliable. My confidence in their output increases with the skills and experience of the planners, estimators and project managers who develop and utilize the tools.

These tools and processes are less robust and so project teams focus on leveraging relationships and collaborative problem solving when faced with project delays.

So…

Are supply chains run effectively?

Is there agreement what SCM is?

Is inventory managed effectively? Does this impact projects?

Does a more synchronized supply chain make sense? Can it happen?

Is experience the key?

Would tools help?

What do we hope to do next?

permits

Develop Modeling Tools to…

Find solutions on the efficient frontier…

Analyze the effectiveness of JIT, Standardization and Modularization, etc.

Design a process so that models get better over time (grow with experience)…

Question: How to model and solve?

Question: How to incorporate suppliers?

Models Accounting For…

Dynamic, stochastic settings…

Considering Lead times

Dynamic nature of uncertainty

Decision making over time

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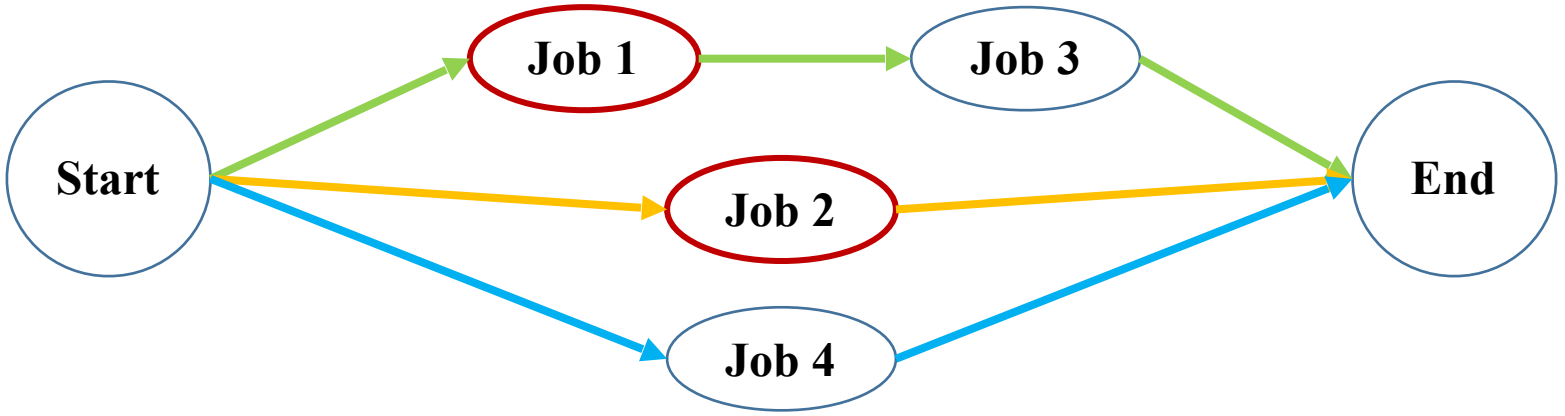
Phil Kaminsky ● Arman Jabbari

- {kaminsky,a.jabbari}@berkeley.edu

Robustness of Schedules -- Root of Problems



Job 1 Processed on Equipment Type 1
Job 3 Processed on Equipment Type 2
Jobs 2, 4 on either
All jobs average 1 unit of time, Jobs 1 and 2 can extend to 2 units of time