

Continuing Discussion of Reward Systems for Engineers & Scientists and Intro to Structuring the PD Organization

April 24, 2007

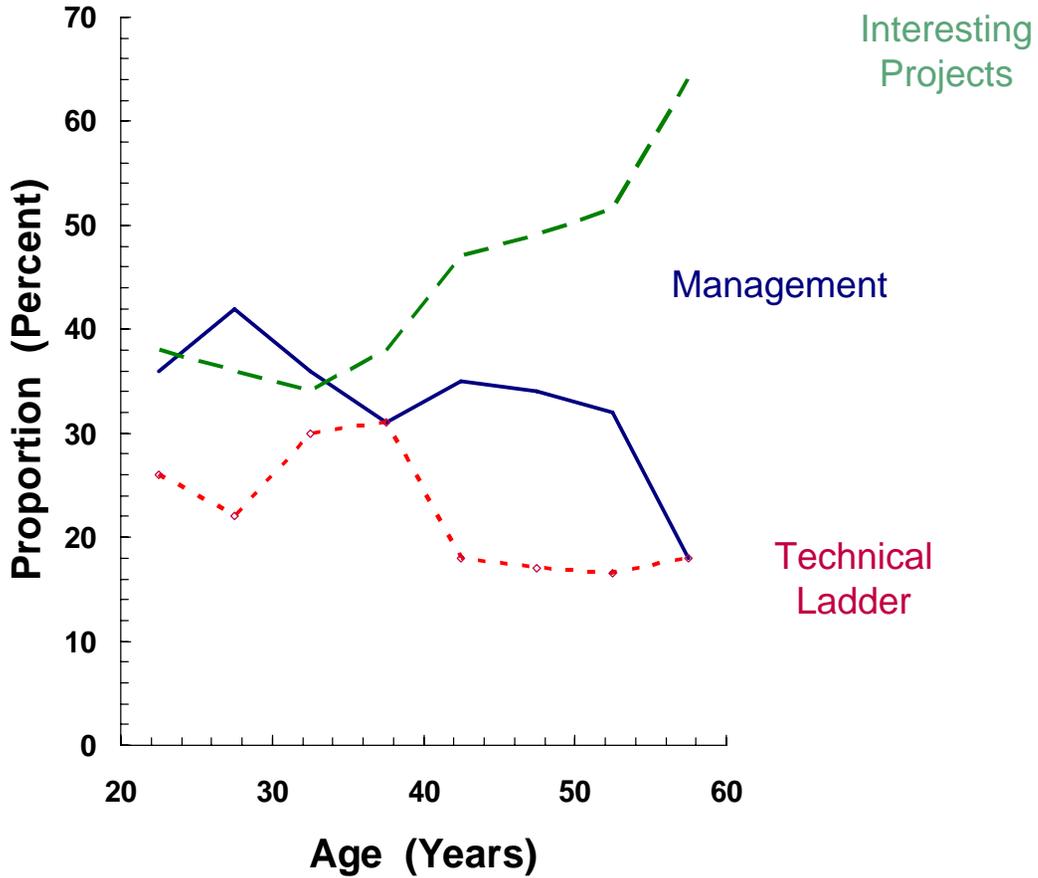


Proportion of Engineers & Scientists in Ten Organizations Choosing Each of Three Possible Career Paths

- MANAGEMENT 32%
- TECHNICAL LADDER 20%
- PROJECT ASSIGNMENT 48%

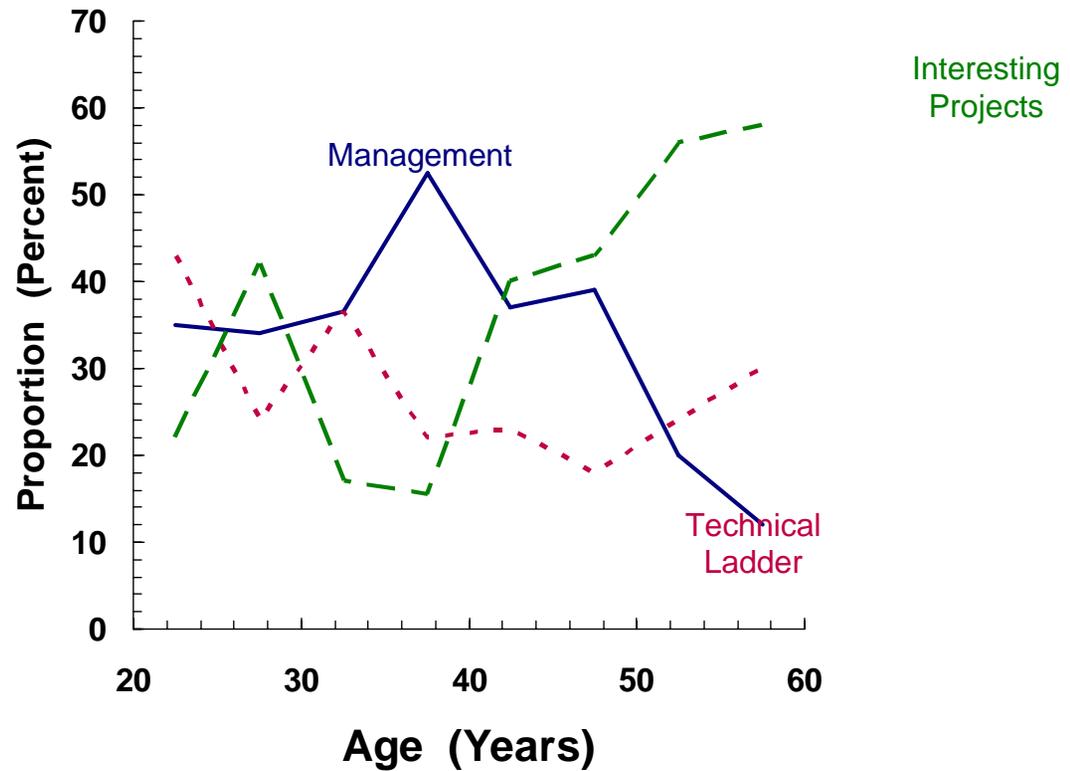


Career Preference as a Function of Age (N = 1,402)



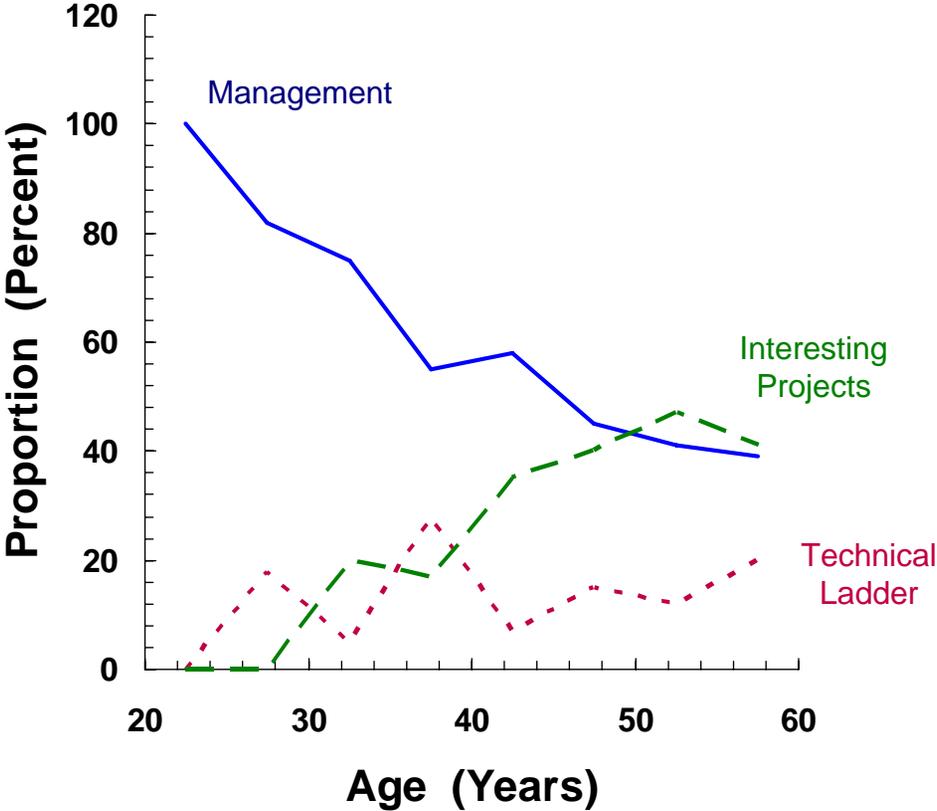


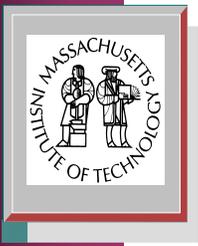
Career Preferences of Technical Ladder Staff as a Function of Age (N = 351)





Career Preferences of Managers as a Function of Age (N = 374)



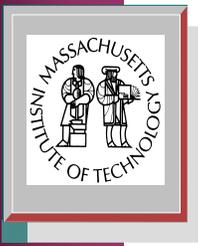


Organizing for More Effective New Product Development

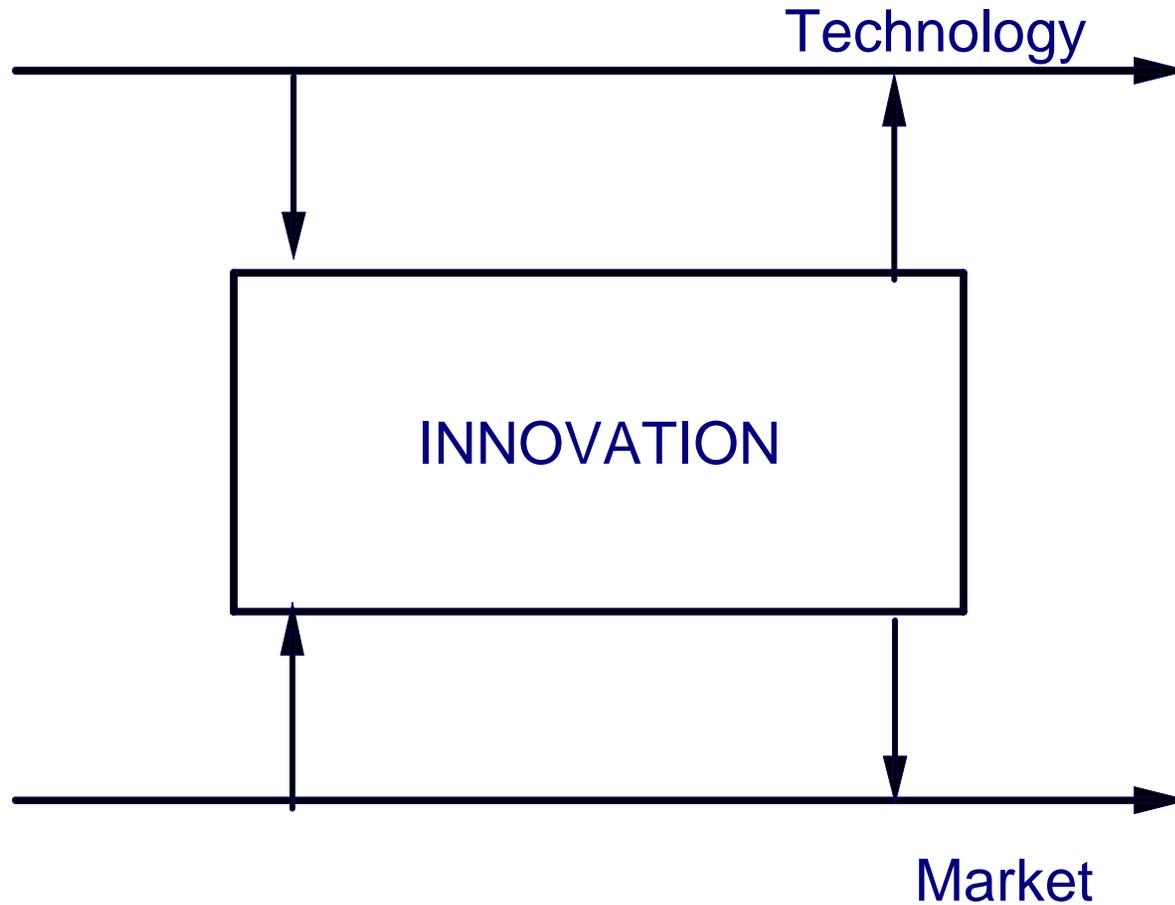


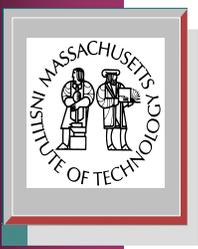
The Basic Process of New Product Innovation

- What are we fundamentally trying to do?
 - A very simple model.



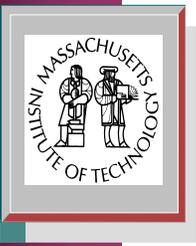
The Process of Innovation



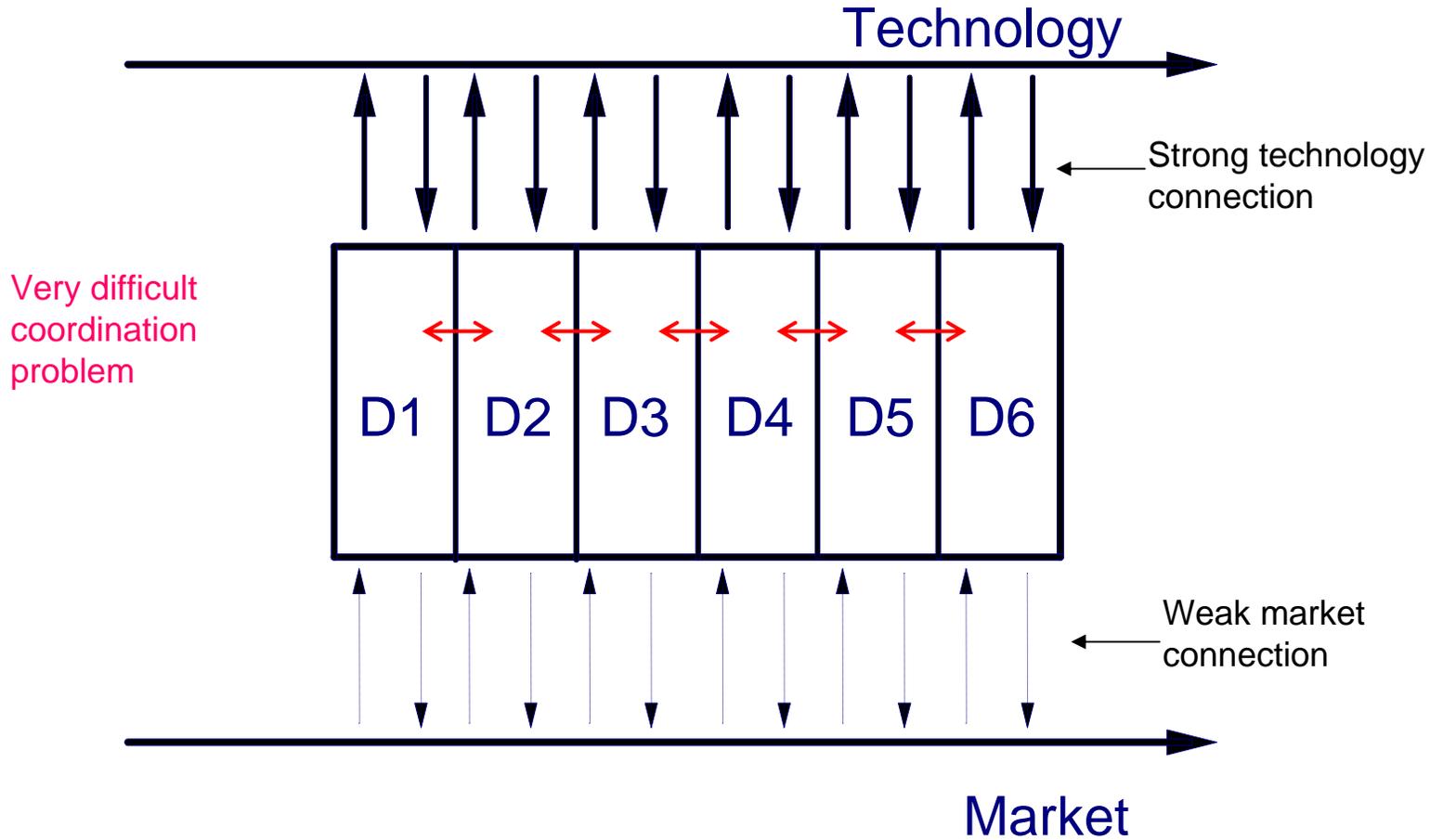


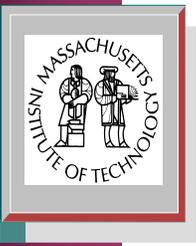
Organizing the Process

- There are many ways in which this process can be organized.
 - However there are really only two basic structures that can be combined in many ways.
 - Product Development managers have been very innovative in combining these two forms into very elaborate organizational structures.
- There has, however, been very little rational basis for choosing among these structures.



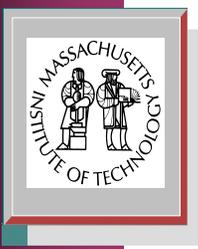
Departmental Organization





Time & Coordination

- But coordination is less necessary, given sufficient time.
 - Some industries have managed to lessen coordination needs by extending development time.

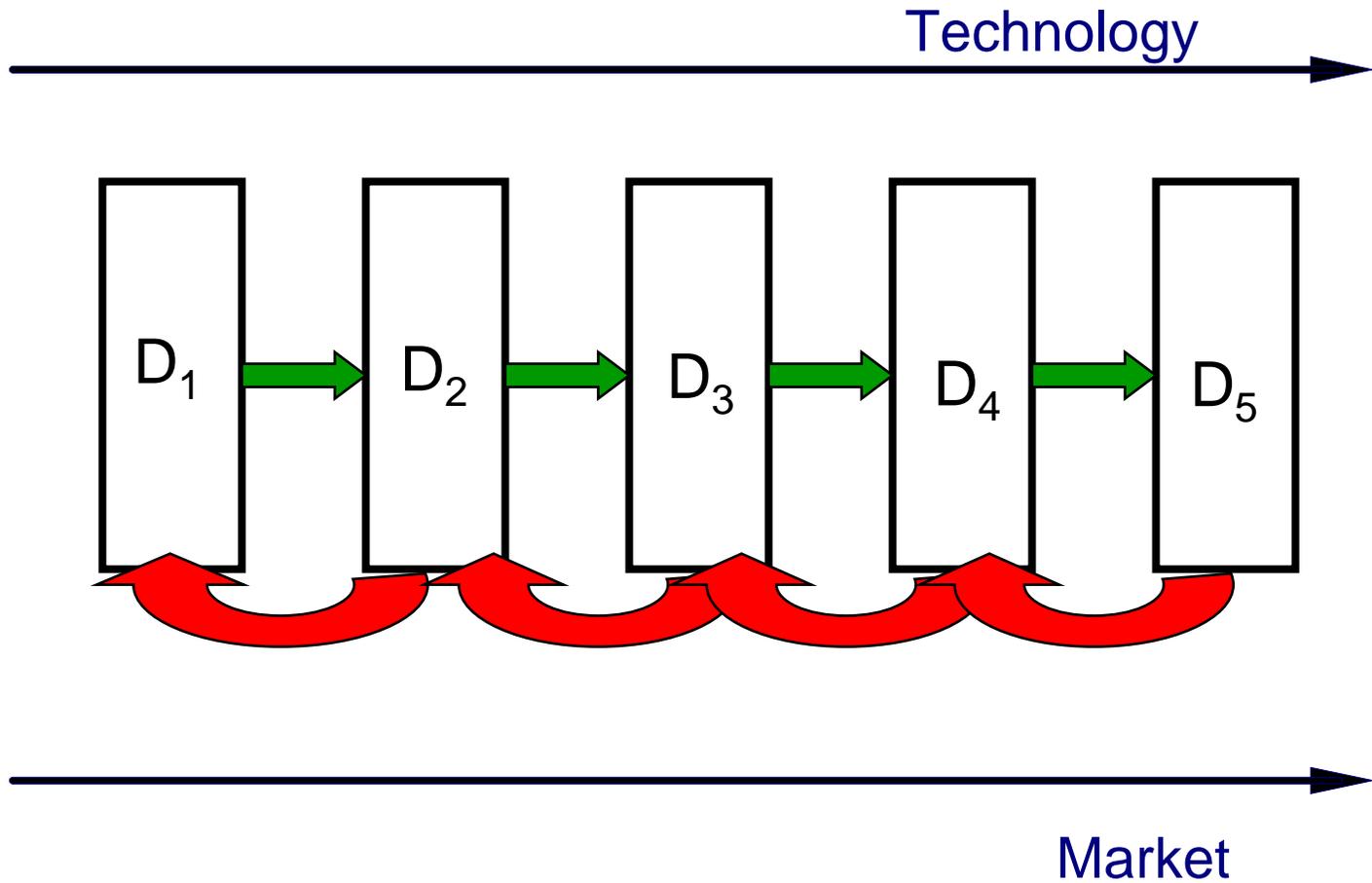


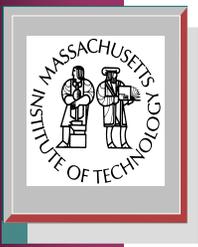
Time & Coordination

- The biggest problem with departmental organization is the difficulty in coordinating the work across the different departments.
- But coordination is less necessary, given sufficient time.
 - Some industries have managed to lessen coordination needs by extending development time.



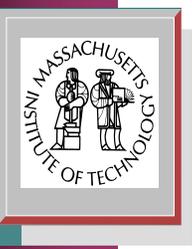
One Approach to Managing Departmental Organization



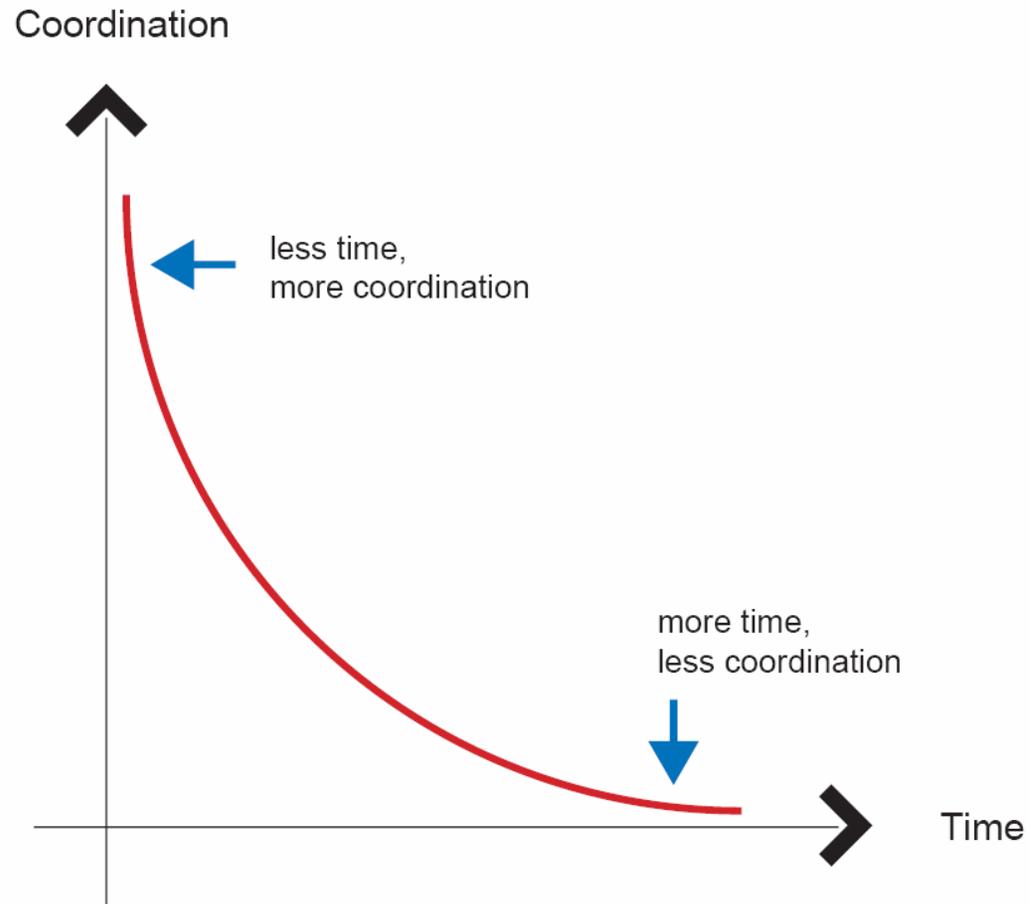


Time & Coordination

- Time can always be substituted for coordination!
- and the converse...
- Better coordination can reduce development time.



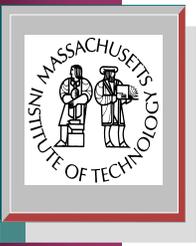
Time & Coordination



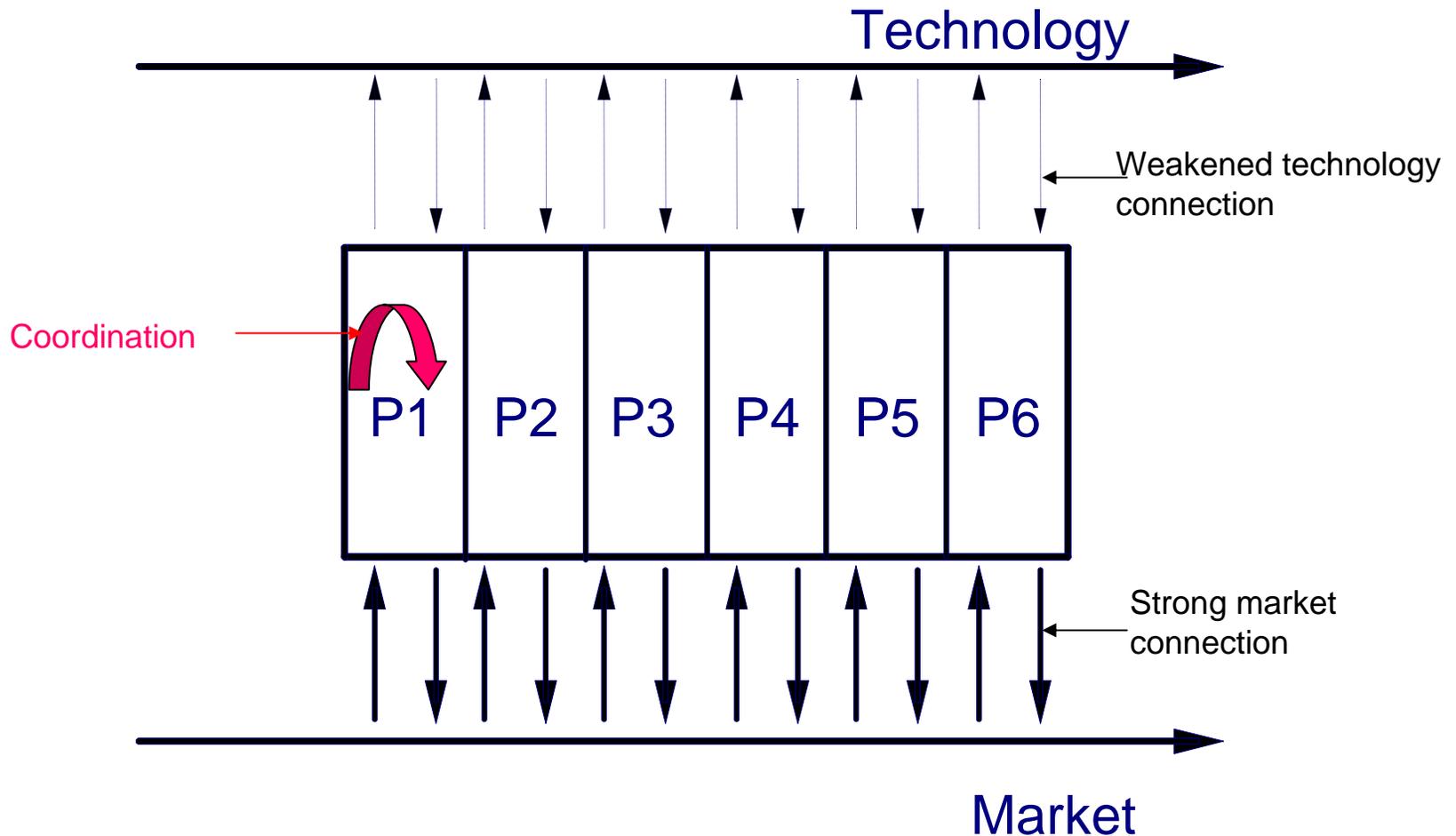


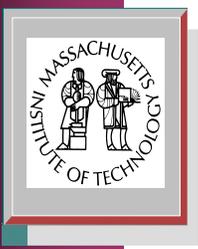
An Alternative Approach

- Beginning with Aerospace and large scale computers, many industries learned how to do this.



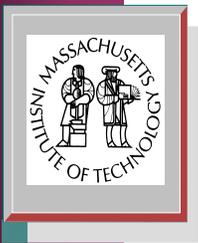
Project Team Organization



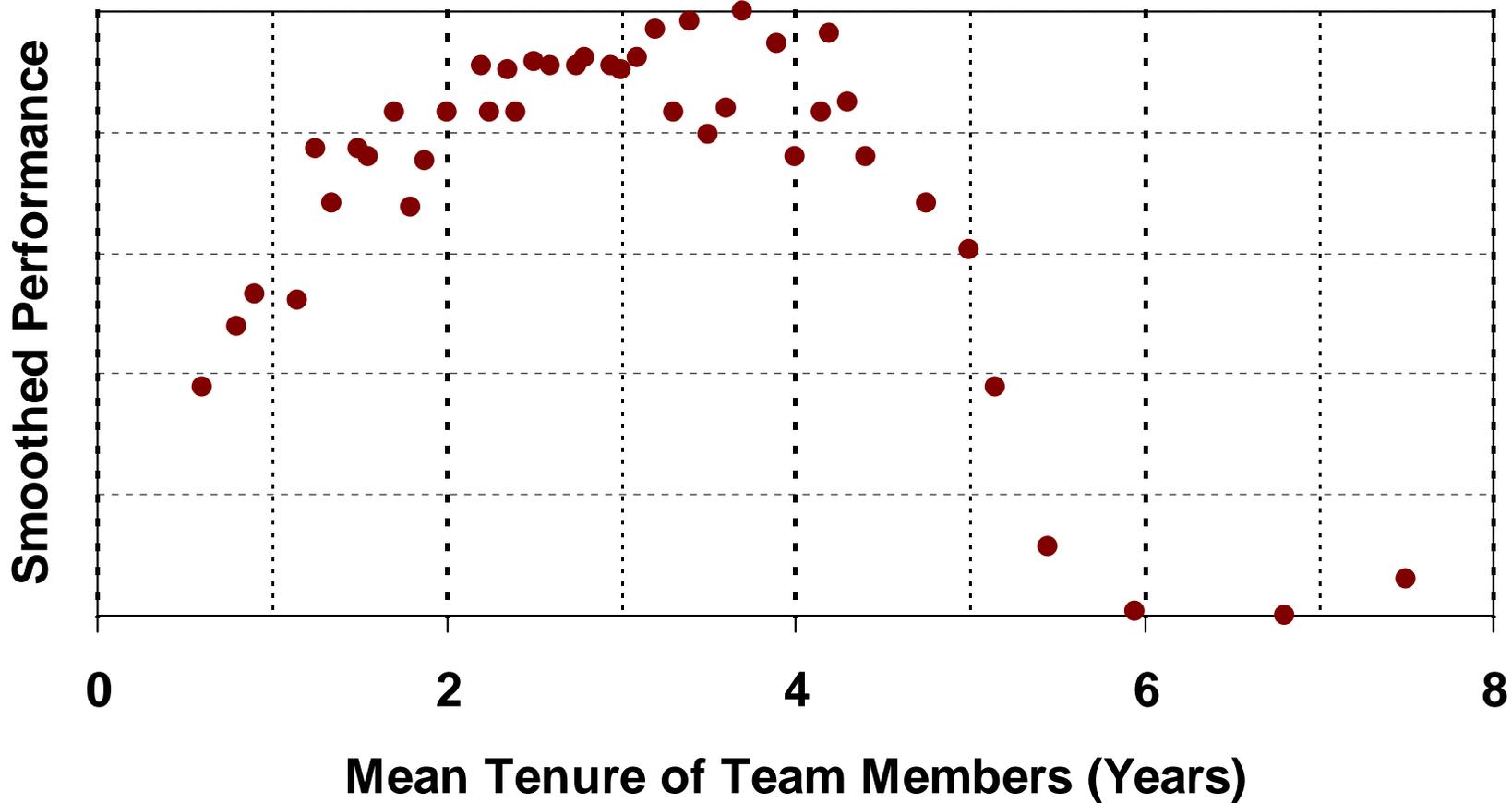


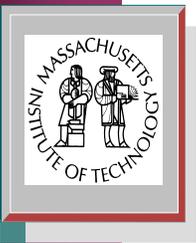
The 'Downside' of Project Team Organization

- Isolation from disciplinary colleagues.
- Team 'Aging'.

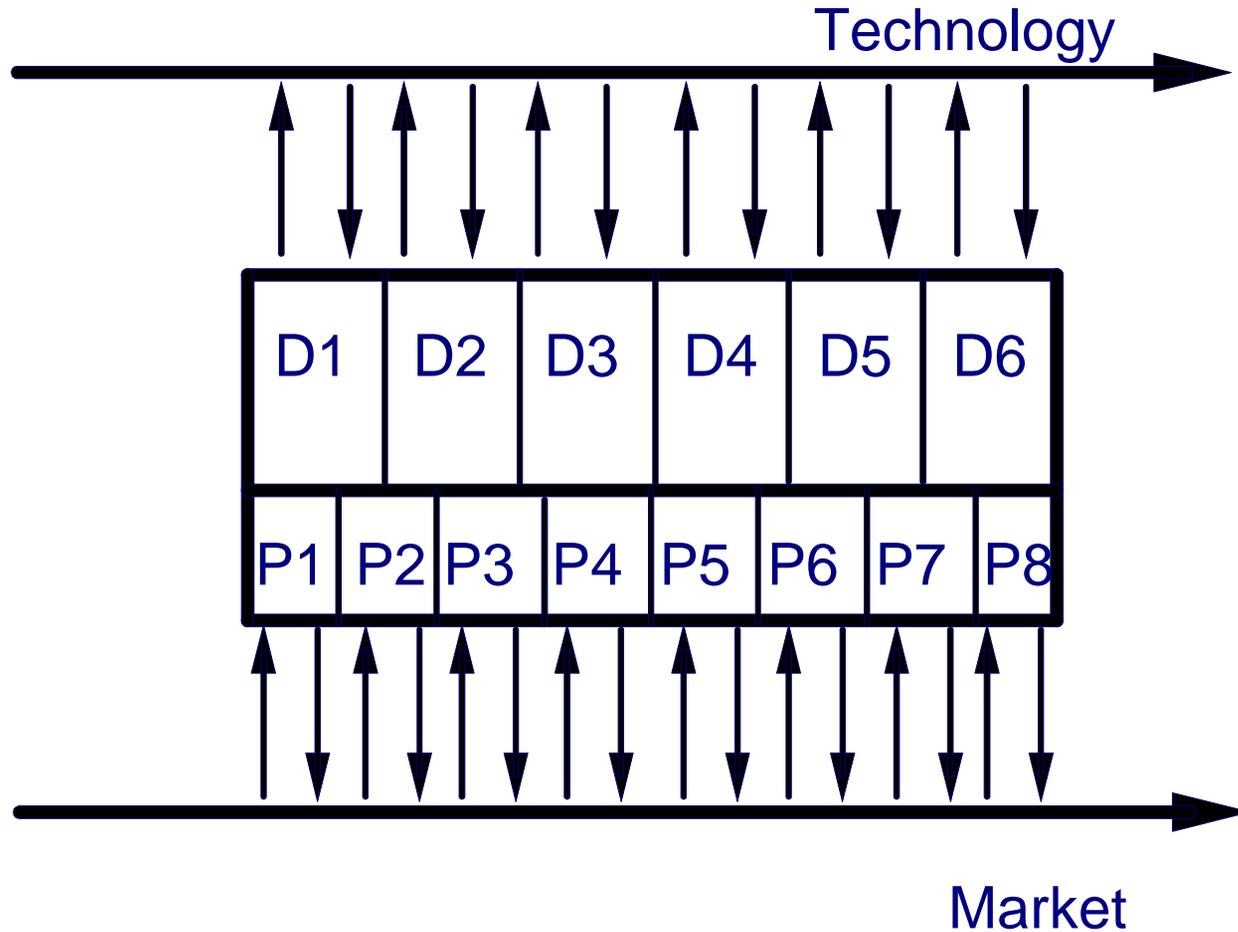


Project Performance as a Function of Team Age (45 Chemical Industry Projects)



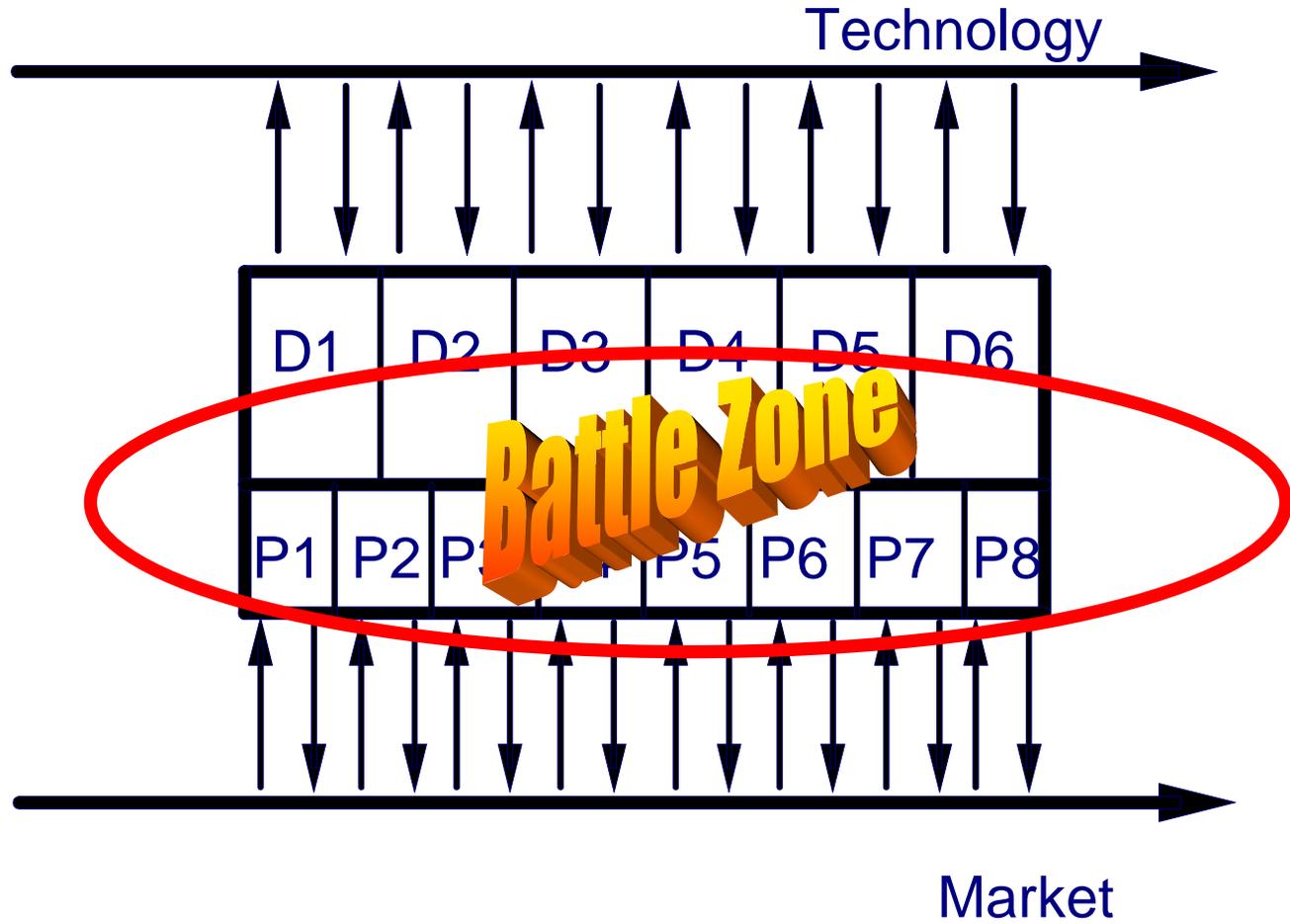


Matrix Organization





Matrix Organization





The Basic Tradeoff and Dilemma in Product Development Organization

- **Departmental Organization**
 - Departmental structure is more closely mapped to the structure of the supporting technologies
 - It thereby provides a better connection to those technologies and better ongoing technical support to the project effort.
 - This is, however, accomplished at the cost of much greater difficulty in coordination of the project tasks and less responsiveness to market change.
- **Project Team Organization**
 - Project Team structure groups people from different disciplines together in a single team all reporting to a common manager.
 - It thereby provides better coordination of the project tasks and increased sensitivity to market dynamics.
 - This is, however, accomplished at the cost of a separation from the disciplinary knowledge underlying the project effort. When this is carried to an extreme, it will gradually erode the technology base of the organization.



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One Layer Lower

- If departmental organization enables closer contact with the technologies supporting a given development, are all technologies equal in the degree to which we must stay in close contact?
- If the answer is 'No', then what determines the degree of contact that we must maintain with different technologies?



First Dimension





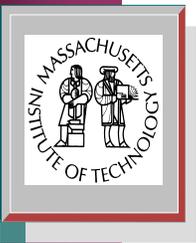
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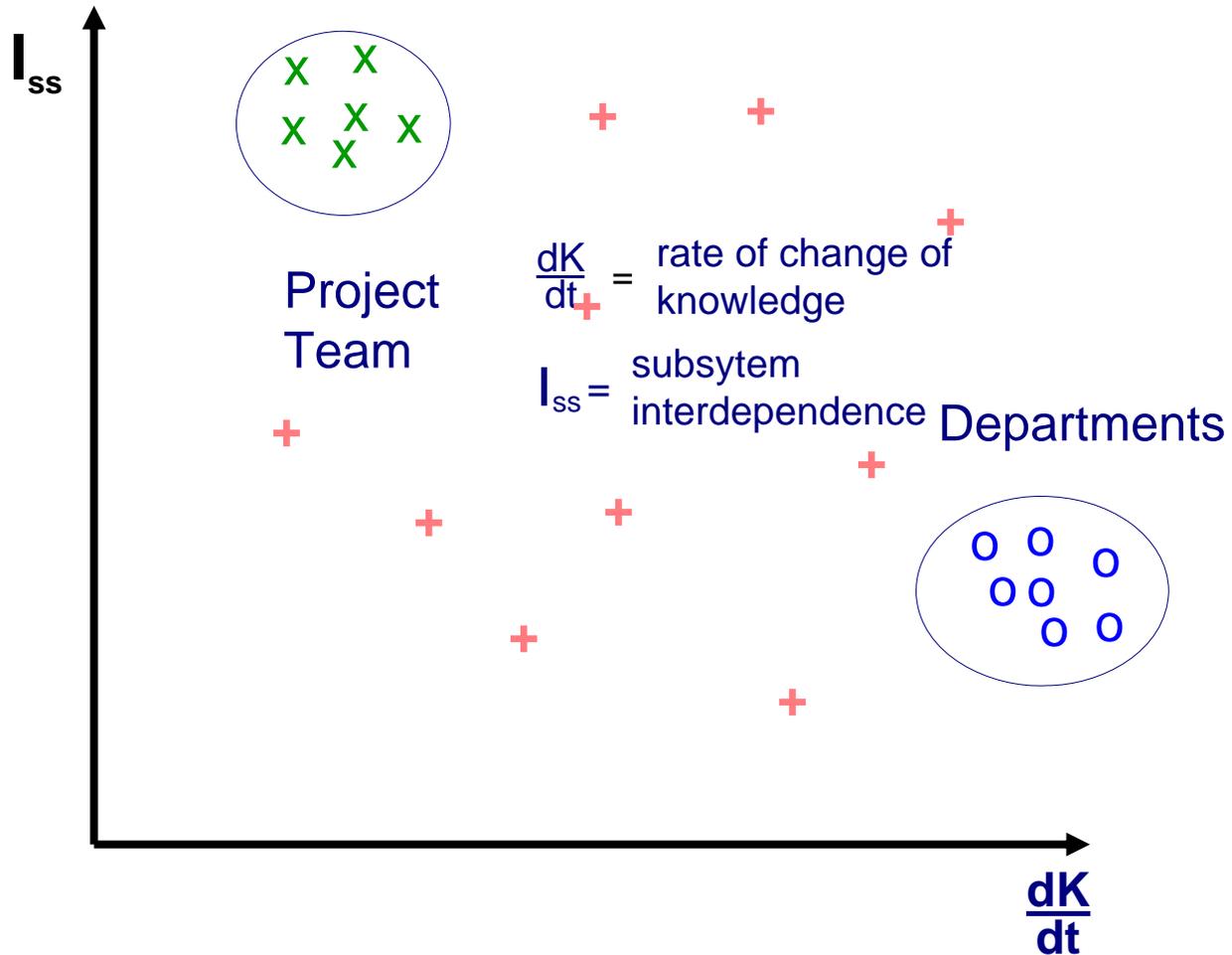


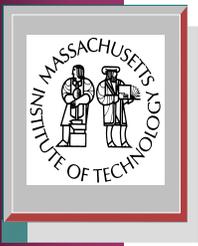
Determinants of Coordination

- Are all projects equal in the amount of coordination that they require?
- If the answer is 'No', then what makes the difference?
 - Why would one project require more coordination than another project requires?

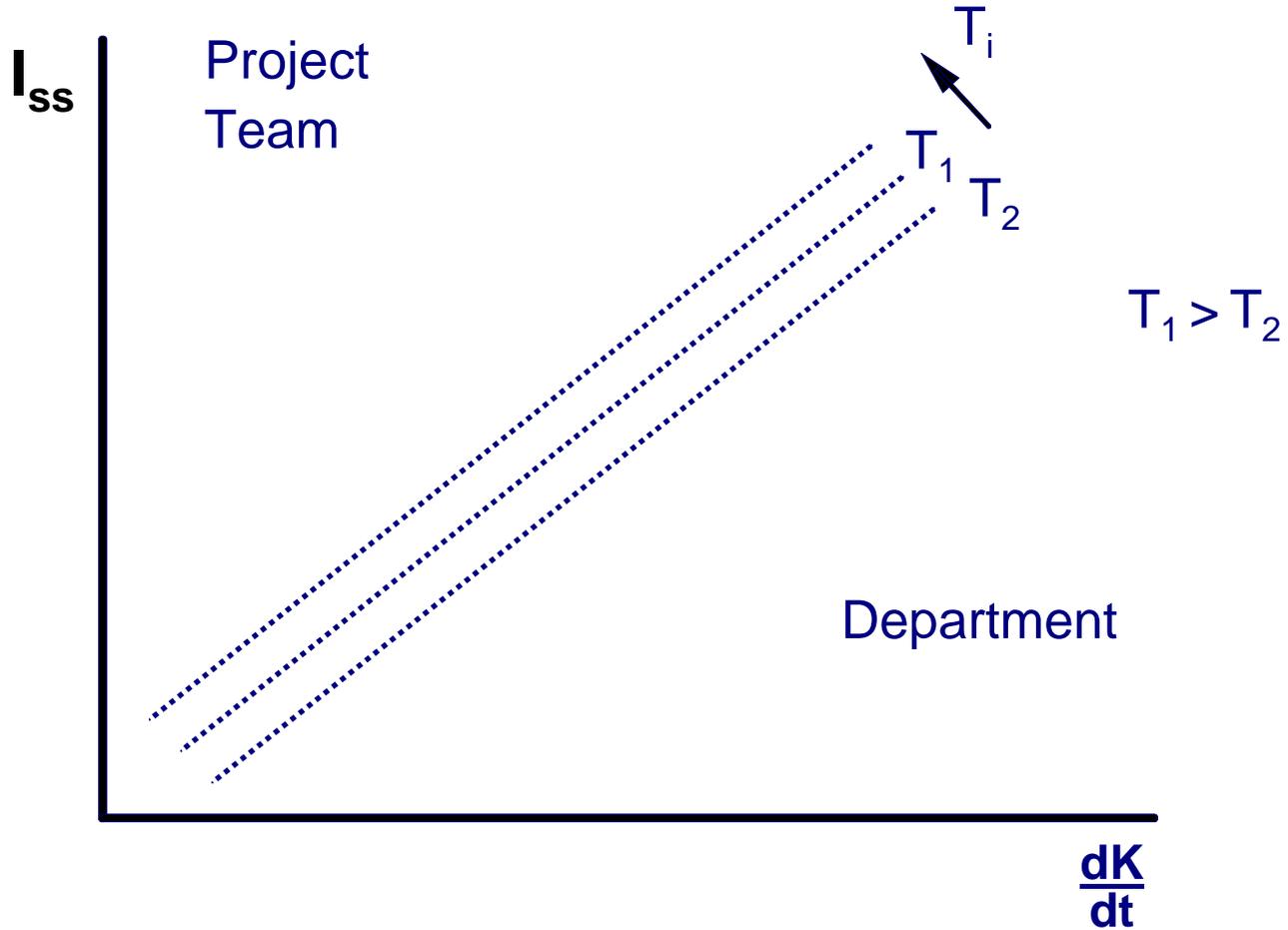


The Second Dimension





The Third Dimension

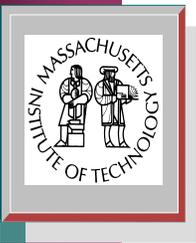


T_i = Duration of project assignment.

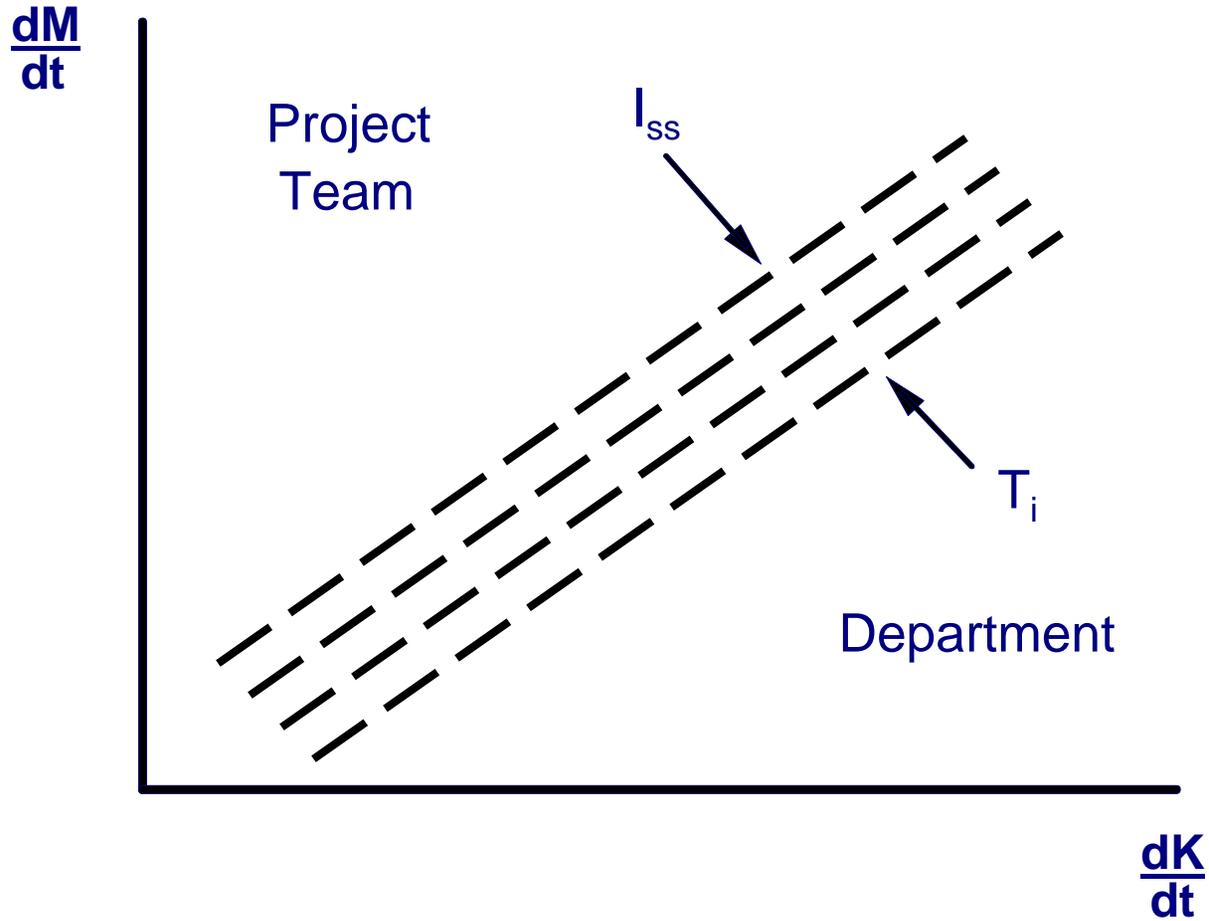


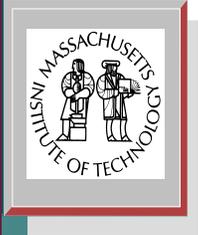
Structuring the Organization

- **Standard Industrial Practice**
 - Ignores the rate at which technologies are developing (despite the fact that this can often be measured).
 - Usually ignores the interdependencies in project work (seasoned project managers are an exception).
 - Focuses on project duration (and usually makes the wrong decision on this parameter).

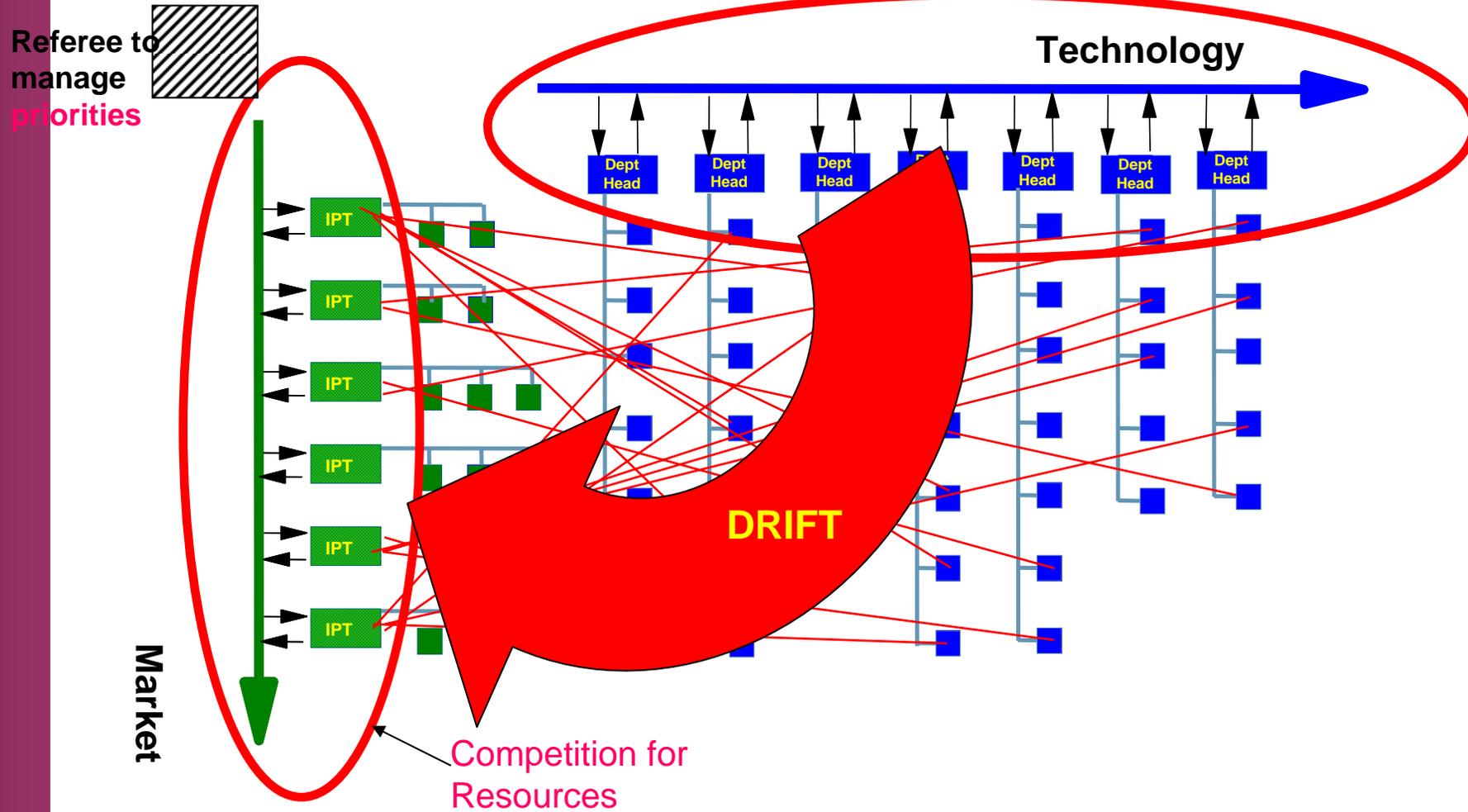


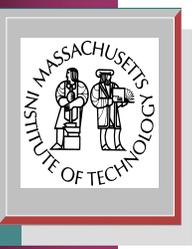
The Fourth Dimension





Matrix Connections to Market and Technology





Imbalance

- What is the problem when power, authority and credit drift to the project side of the product development matrix?
 - Project managers are in a high pressure role.
 - Pressure emanates from the Marketing function and from key customers.
 - The competition already has their next generation out. Where is ours?
 - This can tempt project managers into premature clearance of the product.