Chapter 10 Prototype/Test Cycles

Clark & Wheelwright – Managing New Product and Process Development

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Publications | Awards & Honors

Books

Hayes, Robert H., Steven C. Wheelwright, and Kim B. Clark. *Dynamic Manufacturing: Creating the Learning Organization.* New York, NY: Free Press, 1988. View Details

Baldwin, Carliss Y., and Kim B. Clark. *The Power of Modularity*. Vol. 1, Design Rules. Cambridge, MA: MIT Press, 2006, Chinese Mandarin ed. View Details

Baldwin, Carliss Y., and Kim B. Clark. *The Power of Modularity*. Vol. 1, Design Rules. Tokyo: Research Institute of Economy, Trade and

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Program on Case Method and Participant-Centered Learning (PCMPCL)

photo of participants

More than 70 educators from a number of prominent business schools in the People's Republic of China and Taiwan, including Fudan University, National Taiwan University, Peking University, Renmin University, and Tsinghua University, recently participated in the first Harvard Business School (HBS) Program on Case Method

Areas of Interest

Chapter 10 Prototype/Test Cycles

- Overview
- The Traditional Approach to Prototyping
- Prototyping: A Managerial Perspective
- Matching Prototyping and Development Project Requirements
- Study Questions
- Cases: Sony Corporation: Workstation Division

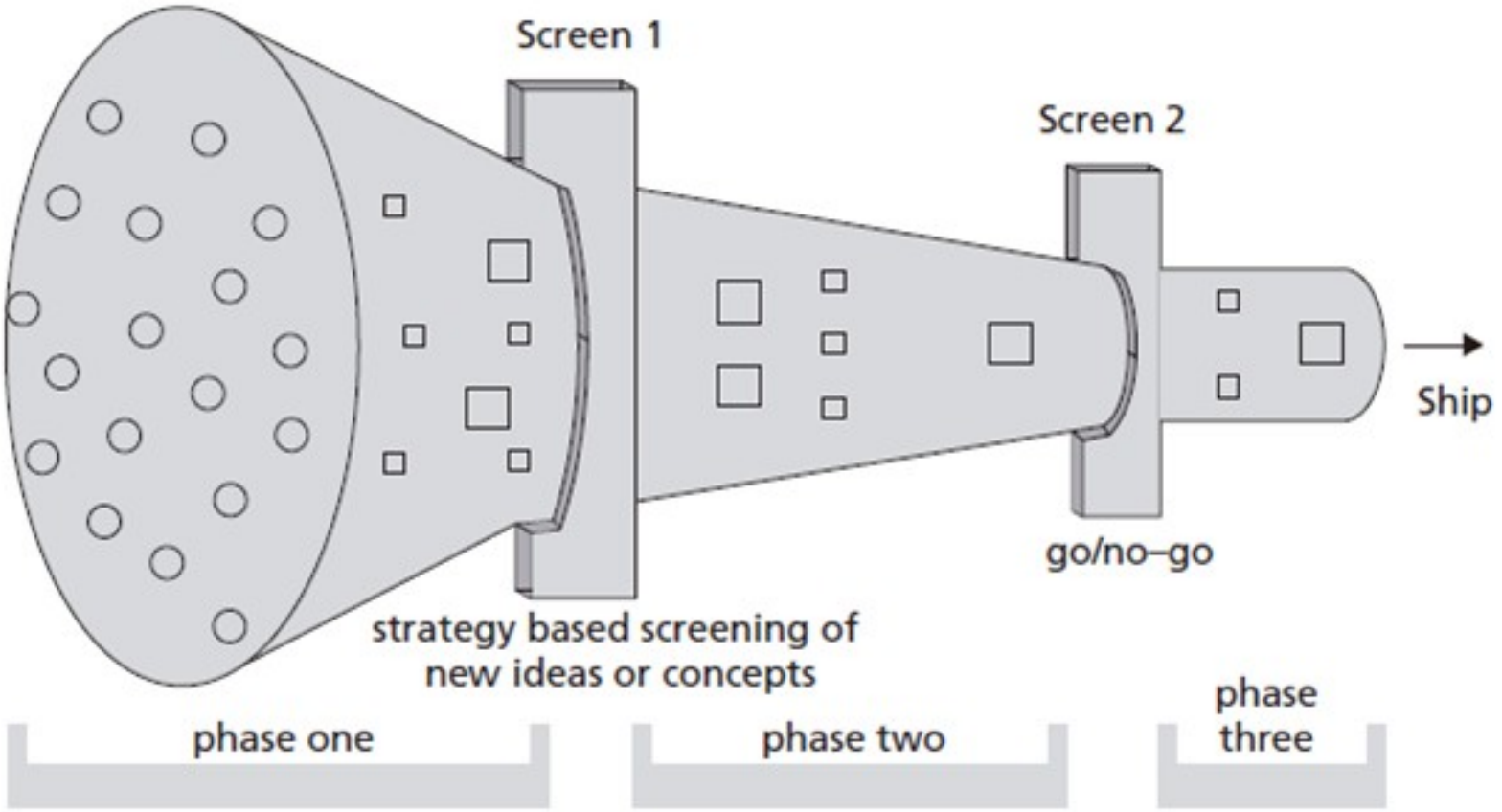
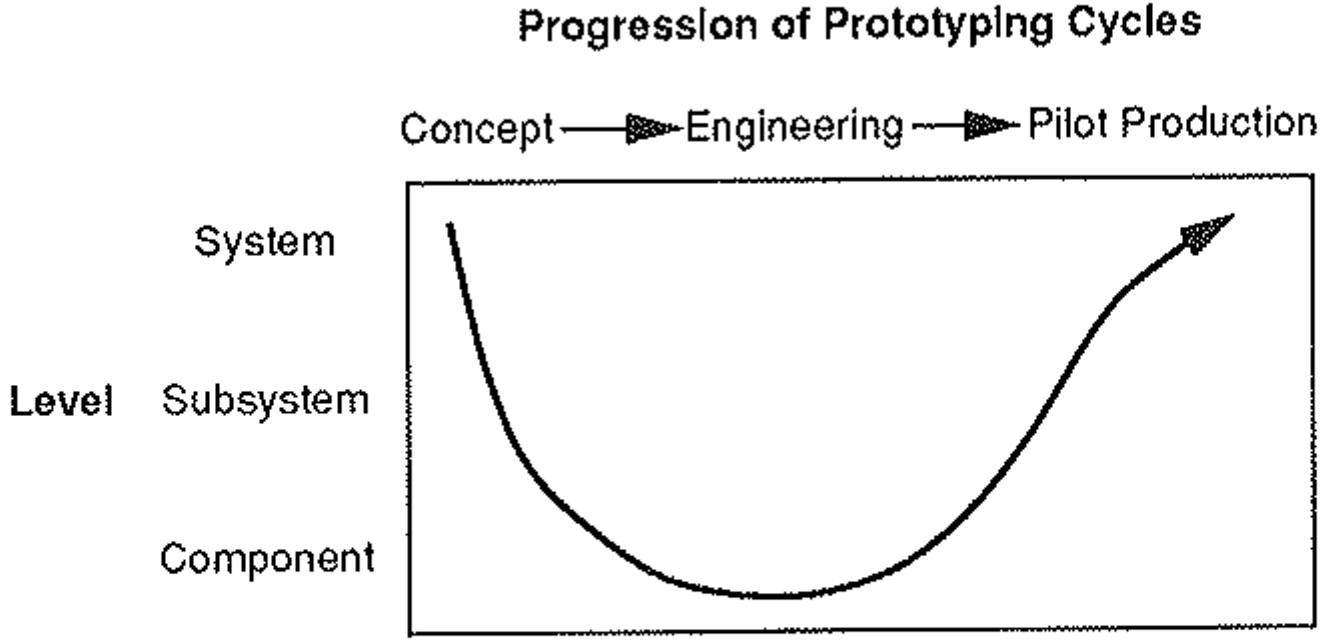

Screen 1
Screen 2
Ship
go/no–go
strategy based screening of
new ideas or concepts
phase one
phase two
phase
three

EXHIBIT 10–1

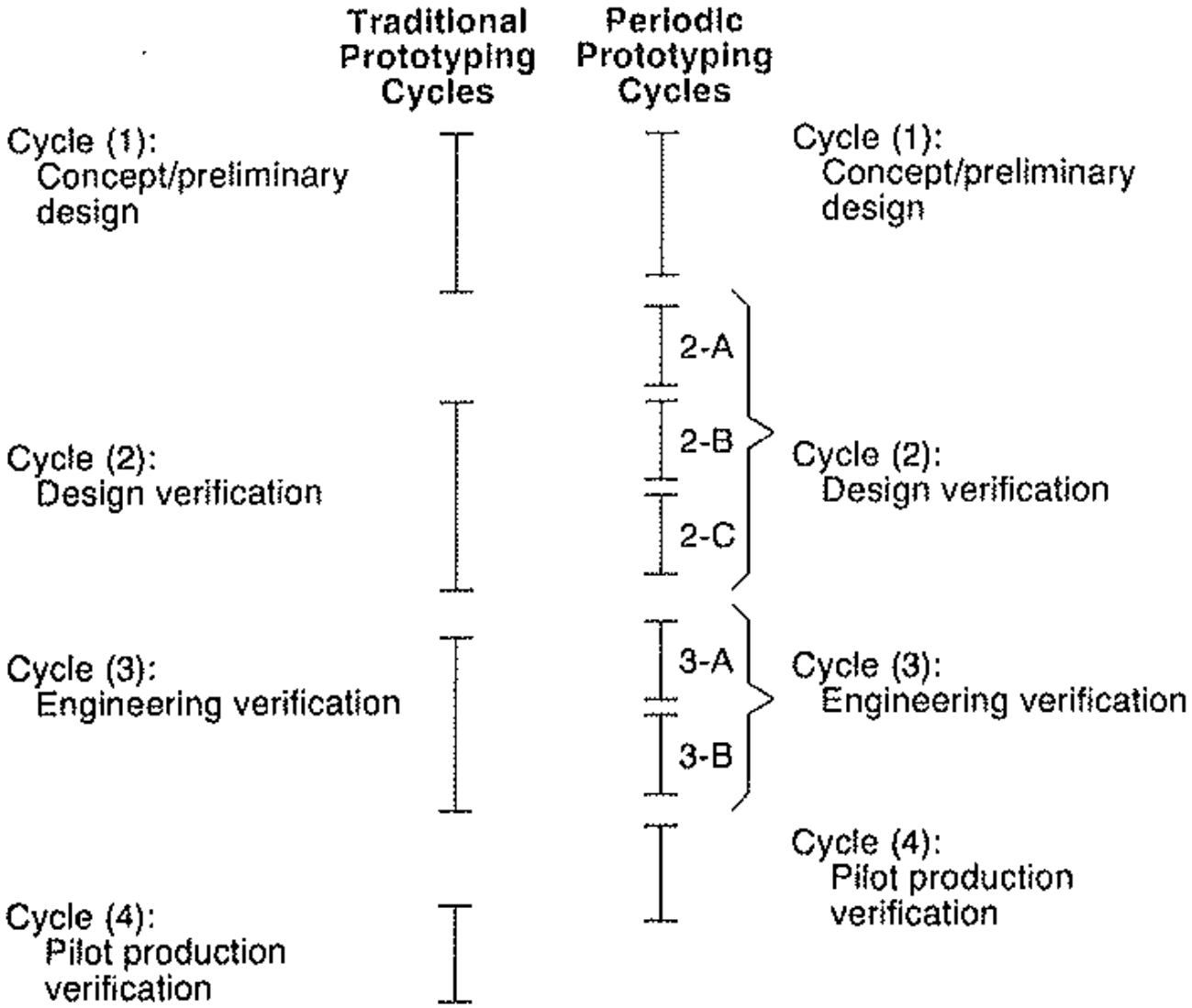
Traditional Path of Design-Build-Test Cycles*



* Traditionally, the initial design-build-test cycle is done at the system level as a prototype of the concept. The next few cycles are then done primarily by engineering at the component level and eventually at the subsystem level. The final prototyping is done at the system level, usually as a pilot production design-build-test cycle.

EXHIBIT 10–3

Contrasting Approaches to Prototyping Cycles*



* In many engineering intensive industries, product development tasks are grouped into four phases or cycles, each with its own prototyping cycle. Adopting a pattern of periodic prototyping does not replace those four phases, but does add several shorter, more integrated prototyping cycles. This can lead to higher quality products and shorter overall development time.

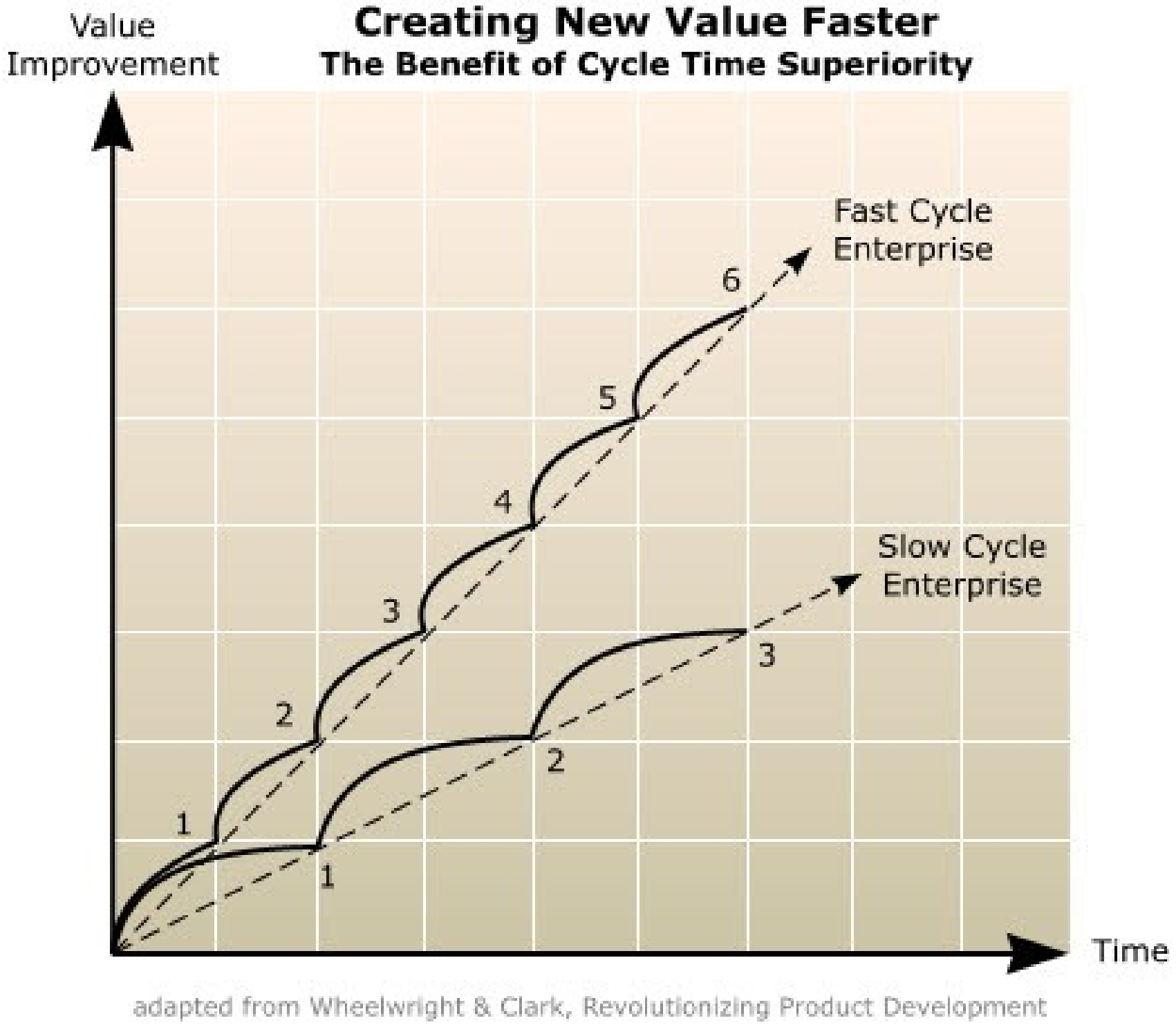
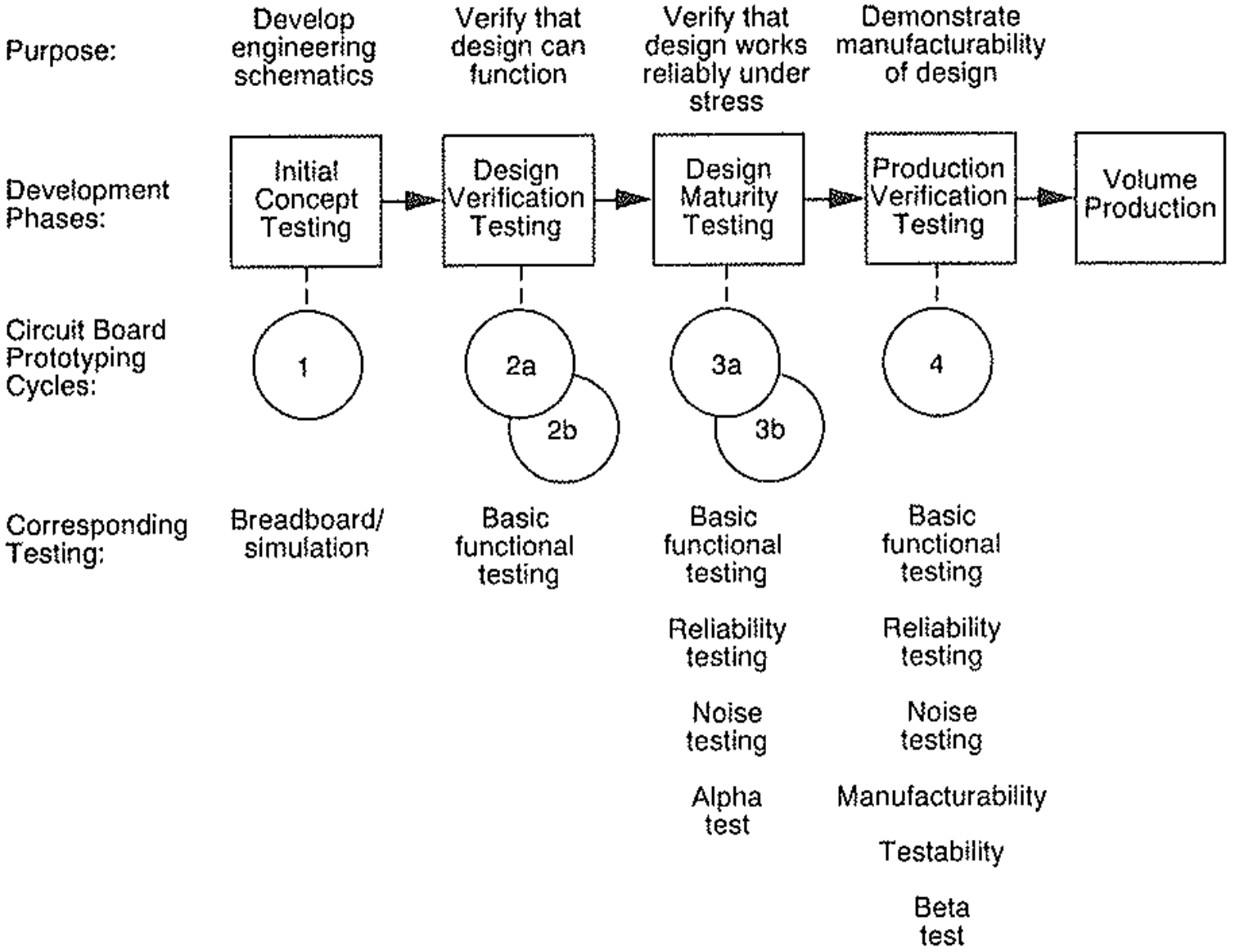

Creating New Value Faster
The Benefit of Cycle Time Superiority
Value Improvement
Fast Cycle Enterprise
Slow Cycle Enterprise
Time
1
2
3
4
5
6
1
2
3
adapted from Wheelwright & Clark, Revolutionizing Product Development

EXHIBIT 10–5

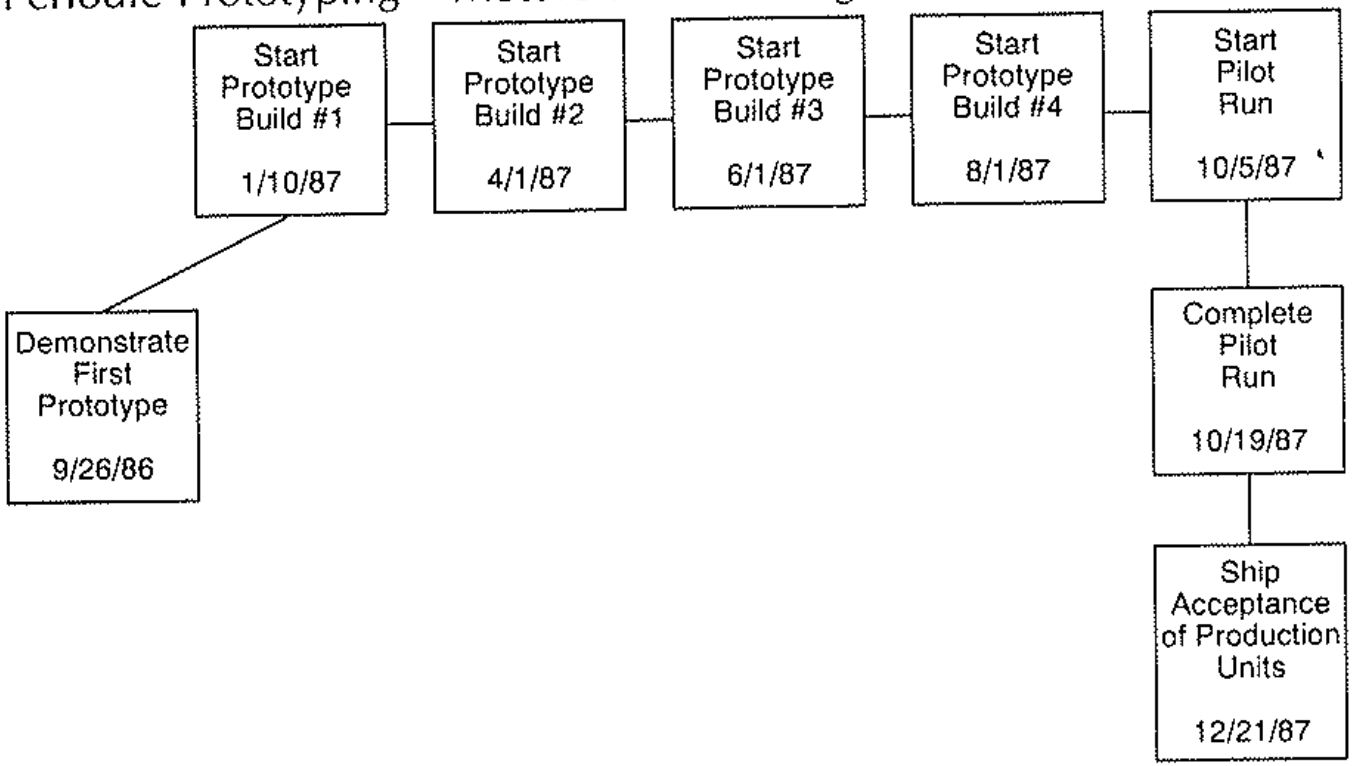
Workstation Product Development Prototyping*



* In the development of a new engineering workstation, there are four primary types of prototyping cycles, each with its own purposes and set of related tests. Often, a complex development project will require two or more cycles of types 2 and 3 to ensure completion of the tasks in that phase before moving on to the next phase.

EXHIBIT 10–8

Periodic Prototyping—Motorola Bandit Pager*



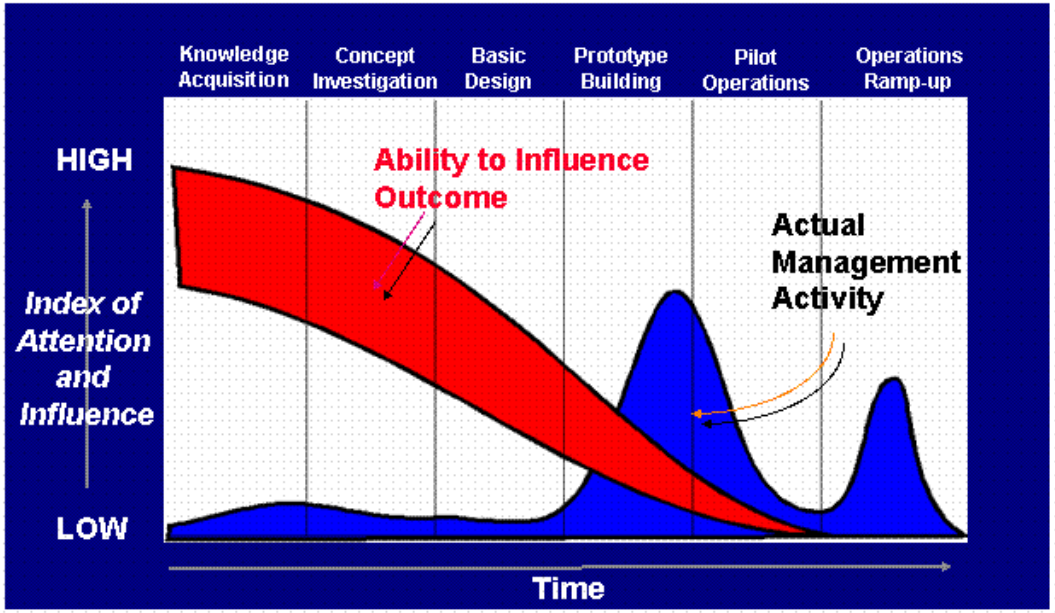
	Demo	Prototype #1	Prototype #2	Prototype #3	Prototype #4	Pilot Run
Location of Build	Lab	Pager factory front end; Manual Bandit back end	Partial Bandit front end; Manual Bandit back end	Complete Bandit built with manual assistance	Full Bandit line	Full Bandit line
Status of Bandit Line	Not started	Initial design	Front end largely complete; auto test in back end (with manual assembly)	Hardware complete; CIM control started	Bandit line completed	Final line revisions completed

Tipo de projeto	Descrição
Pesquisa ou desenvolvimento avançado	Buscam a invenção de uma nova tecnologia ou conhecimento para que posteriormente possam estar disponíveis para aplicação em projetos específicos
Inovação, radical ou *Breakthrough*	Envolvem a criação de uma primeira geração de um produto ou processo inteiro novo. Seus conceitos ou tecnologias estabelecem novos parâmetros da a organização
Plataforma ou geracional	Estabelecem uma nova arquitetura básica para uma família de produtos que seguirão este projeto inicial
Derivativo	Projeto de melhoria e refinamento para melhor atender necessidades de mercado
Alianças, projetos em parceria ou *follow source*	Projeto é feito por outras unidades do grupo, clientes ou contrato tecnologia. Não requer alterações significativas, unidade local adapta para condições locais

Core argument

- An improvement to innovative process can lead companies to achieve goals and dominate markets.

Timing and Impact of Managerial Attention



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Recommendations

Managers participation Like (Kim and Willemon, 2002) the authors attempt to the fact that managers should be more present in every step of the process, not just only at the end evaluating the final prototype.

Models of Prototyping: Dominant Orientation

PROJECT TYPE	Model I Rapid Response to Engineering • rapid turnaround • flexible specs • engineering control • technical focus	Model II (periodic prototyping) Integrated System Solution • team learning • specs established early • team control • system integration	Model III Replicate Manufacturing Early • prototype quality • established specs • manufacturing control • manufacturability
Breakthrough (technical)	– creative, innovative results – fast response enhances feedback – manufacturing in late performance and features – easily overcome problems with manufacturing	– system focus causes technical compromise – complexity and uncertainty slow down technical work – constraints of system limit innovation	– slow turnaround; late introductions – engineers out of loop – performance suffers, leading to many late engineering changes
Platform (new architecture)	– technical focus skews architecture, hurts balance – system performance suffers in field leading to design revisions	– system focus achieves clear interfaces, integration – team learning leads to early design convergence – team control facilitates communication, eliminates late design changes	– manufacturing focus hurts design balance – performance inadequate, leading to late design revisions
Incremental (stable architecture)	– lack early manufacturing involvement – late revisions required for manufacturability	– team approach is overkill; complicates project – system focus leads to late revisions because of technical (processing) problems	– early involvement solves problems in design – smooth ramp-up – enhanced reliability and cost performance

- O que é o ciclo de Design-Build-Test em prototipagem?
- O que a abordagem convencional?
- Problemas com a aboradgem convencional?
- O que é a abordagem periodica de prototipagem?
- Como selecionar diferentes abordagens de prototipagem? Por que a Periodica não é adequada para Avião de garnde porte?