E

BOOTSTRAP SEMINAR
Nov 30 - Dec 2, 1992

Foil Set E:

THE CODIAK PROCESS —

KNOWLEDGE WORK AS A BASIC, STRATEGIC CAPABILITY

Douglas C. Engelbart, Bootstrap Institute

Notes

E1

BASIC BOOTSTRAP CONCEPTS

Objective: Pursue high-performance org
Hypothesis #1: Whole-system Augmentation
Hypothesis #2: ABC's of Org Improvement
Hypothesis #3: Bootstrap Strategy
Hypothesis #4: Collab. Knowledge Work (CODIAK)
Hypothesis #5: Open Hyperdoc System (OHS)
Hypothesis #6: Joining forces in a C Community

(assumes major paradigm shifts throughout)

Notes

E2

Hypothesis #4: Collab. Knowledge Work (CODIAK)

Early focus on improving a special collection of knowledge-work capabilities offers strategic investment leverage.

- Basic CODIAK Model
- Knowledge-Domain interoperability
- Common CODIAK Problems
- Strategic CODIAK Augmentation
- Conclusion

Notes

(Same as D20)

The CODIAK capability is a critical basic component underlying all three of these, strategically important capabilities.

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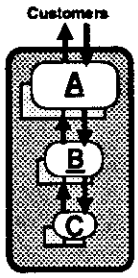
BOOTSTRAPPING: STRATEGIC INVESTMENT CRITERIA



Selecting capabilities for **C** to improve that serve **A** and **C**, as well as **B**, offers special investment leverage. Start with these 3 most-basic capabilities:

1. doing group knowledge work;
2. transfer results "up the line" to respective "customers" (↑);
3. integrate information coming "down the line" from respective "customers" (↓).

(note that capabilities 2 and 3 depend on 1)

E4

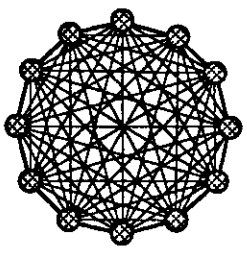
PROCESSES FOR "HEAVY KNOWLEDGE WORK" HAVE SPECIAL STRATEGIC IMPORTANCE

In this sense, the greater is the size, complexity, and urgency of a knowledge-intensive problem, the *"heavier"* is the knowledge work associated with developing a solution.

Strategic concepts in Augmentation Theory and Bootstrapping point to the fundamental importance of improving the core processes of heavy knowledge work.

E5

BEGIN WITH BASICS: PEOPLE WORKING TOGETHER IN AN ORGANIZATIONAL UNIT



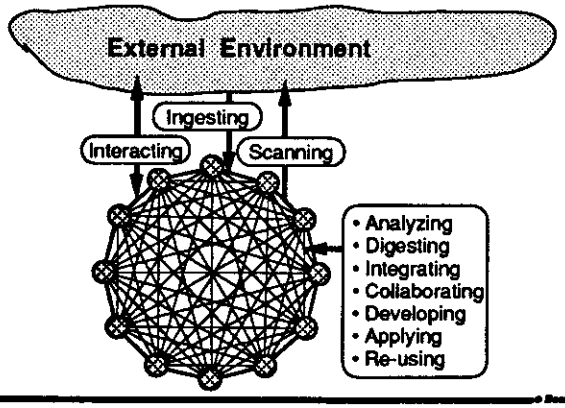
Examples of org units, or ***knowledge domains***:

- an individual
- project team
- department
- functional unit
- task force
- committee
- whole org
- community

Note: can be across-multiple organizations

E6

EVERY VIABLE ORGANIZATIONAL UNIT REQUIRES BASIC KNOWLEDGE PROCESSES



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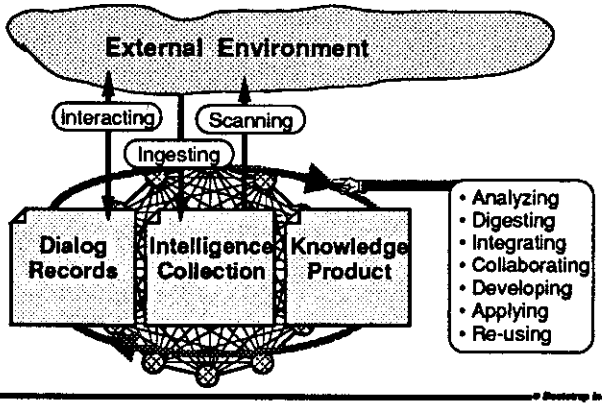
BASIC KNOWLEDGE PROCESS RESULTS IN A DYNAMICALLY EVOLVING KNOWLEDGE BASE



Notes

E8

THIS EMERGES AS THE HIGHEST-LEVERAGE BASIC ORGANIZATIONAL CAPABILITY

*The **CO**ncurrent **D**evelopment, **I**ntegration, and **A**pplication of **K**nowledge* ***(CODIAK)***

Developing an evolving knowledge base that integrates the concurrent contributions of many distributed participants, operating from the many (nested) knowledge domains involved within and among our enterprises, and concurrently supporting their application of the included knowledge.

Notes

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Below we use the model of a complex product-development project, in an industrial context, to illustrate the development of our CODIAK concepts.

Change the scale and substance, as for almost any complex pursuit, and the CODIAK picture will still emerge as a critical capability to augment.

("Handbook" -- the electronic embodiment of a knowledge product.)

E9

THE RESULTING KNOWLEDGE BASE REPRESENTS A VALUABLE *TANGIBLE* ASSET!

Dialog Records	External Intelligence	Knowledge Product
Memos	Articles, books	Proposals
Status reports	Reports, papers	Plans
Meeting minutes	Conf. proceedings	Budgets
Decision trails	Brochures	Legal contracts
Design rationale	Market surveys	Milestones
Change requests	Industry trends	Time lines
Commentary	Competition	Design specs
Lessons learned	Suppliers info	Product descriptions
Needs & Possib.	Customer info	Mfg plans
Bug reports	New technologies	Test plans & results
Field spt logs	New techniques	Field spt manuals
Design reviews	Trip Reports	Open Issues

E10

*** PARADIGM ALERT ***

The English language has no word for this *"knowledge product".*

I chose the term "Handbook" for this "baseline" project view.

Knowledge Product / Current "Handbook"
Proposals
Plans
Budgets
Legal contracts
Milestones
Time lines
Design specs
Product descriptions
Mfg plans
Test plans & results
Field spt manuals
Open Issues

E11

THE IDEAL HANDBOOK WOULD SHOW THE COMPLETE, CURRENT PROJECT STATUS

Goals, Plans, Designs, Budgets, Targets, Commitments, Schedules, Status, Staffing, Organization, Methods, Expectations, Specifications, Work Breakdown Structure, External Reference Data, ...

If kept constantly current and with visible relevance for all, a dynamic Handbook has central importance.

Storing intermediate Handbook states, and a record of the transitional dialog and reasoning, yields a critically valuable *organizational memory.*

E12

SEMINAR GROUP DISCUSSION

Objective:

Appreciating the value of intelligence collections

Task:

[To be determined]

Notes

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Hypothesis #4: Collab. Knowledge Work (CODIAK)

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- **Basic CODIAK Model**
- **Knowledge-Domain interoperability**
- **Common CODIAK Problems**
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A *KNOWLEDGE DOMAIN* IS AN ENVIRONMENT FOR A SPECIFIC KIND OF KNOWLEDGE WORK

A heavy-knowledge-work domain is made up of many levels of nested, concurrently active sub-domains.

Interoperability -- the dynamic, concurrent inter-change of dialog and knowledge products between these domains -- is a critically important factor in improving our capability for heavy knowledge work.

Where different of these nested domains are being seperately improved with inconsistent approaches, we're in danger of having domain-wall collisions instead of domain interoperability!

Notes

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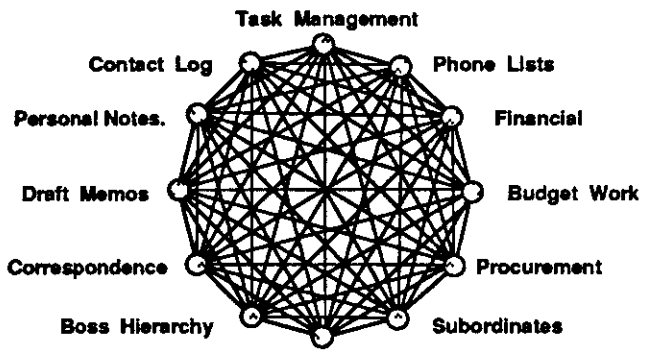
EACH FUNCTIONAL DOMAIN IS A CANDIDATE FOR WORKING INTERCHANGE WITH ALL OTHERS

One Person's Knowledge Workshop



Notes

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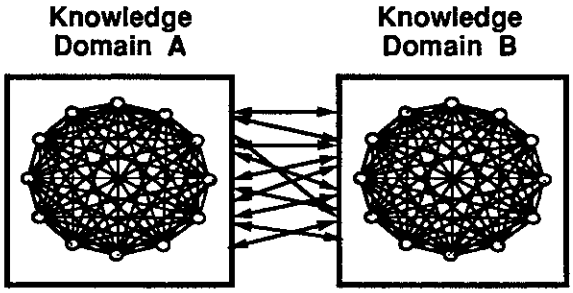
CLOSE COOPERATION BETWEEN COMPOUND KNOWLEDGE DOMAINS PUTS NEW DEMANDS ON KNOWLEDGE-WORK INTERCHANGE



Notes

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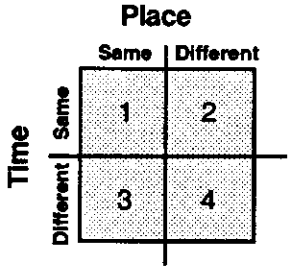
ESSENTIAL GOAL: PROVIDE EFFECTIVE INTER-OPERABILITY BETWEEN KNOWLEDGE WORKERS

- The purpose of interoperability between technological modules is to avoid having information islands, between which electronic communications cannot flow.
- For humans, assume the same purpose -- interoperability to avoid having information islands between human knowledge-work domains.

E18

COLLABORATIVE PROCESSES GENERALLY CONSIDERED WITHIN FOUR SEPARATE DOMAINS



1. Face-to-face meetings.
2. Teleconferencing: video; audio; shared-screen.

3 & 4. Shared files, mail, document exchange.

Complete interoperability between these domains is a basic requirement. (Not yet being addressed.)

Notes

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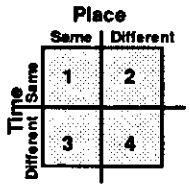
ACTUALLY THE 1-2-3-4 DOMAINS ARE MERCILESSLY SCRAMBLED

Conventional Model of Group Work



Actual Topology More Like This

Different work domains (groups, functions) are concurrently interacting in each of the Place/Time modes.

Notes

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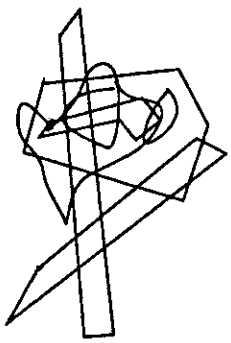
CONSIDER SOME KNOWLEDGE DOMAINS WITH WHICH YOU INTERSECT SIGNIFICANTLY



The old, paper-based operations adapted to the necessary interoperation.

Desktop publishing and WYSIWYG tools automate the paper equivalent ...

But to extend significantly into online access, study, and collaboration requires a great deal more interop coordination.

Here emerges the critical factor which shifts us into a new work and organization paradigm: harnessing our knowledge products in an online work mode. The concept of "document" as represented by typographically crafted pages (or frames, or cards) simply won't suffice, any more than did the "horseless carriage" concept.

Here we see the emergence of the "concurrency" factor; the development cycles of all these knowledge products (handbooks) are concurrently evolving, interdependently.

Notes

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HANDBOOKS USUALLY EVOLVE PIECEWISE VIA CYCLES WITHIN CYCLES

Larger projects are made up of smaller projects, which are made up of smaller projects, etc. -- finally to the smallest projects of each individual.

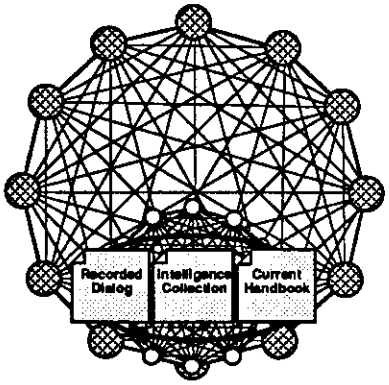
The activity records of most smaller projects warrant recording within their own "Handbook Sections."

These Sections become modules subjected to dialog and coordination in the next-larger Handbook.

The over-all Handbook Cycle requires concurrent interoperation among the many domains doing these "Sub-Cycles" in the work breakdown structure.

E22

ORG UNIT'S *CODIAK* PROCESS NESTED WITHIN OTHER ORG EFFORTS



Notes

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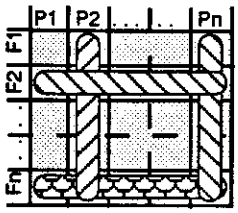
CODIAK EXTENDS THROUGHOUT THE LIFE CYCLE OF A PROJECT TEAM

- Developed, integrated, and applied by many players over time.
- Handbook elements are under continuous and often concurrent revision.

E24

CONSIDER THE DOMAINS WITHIN A MATRIX ORGANIZATION OF PROJECTS AND FUNCTIONS



Each column, each row, and each intersection is an active knowledge domain.

If the respective domains are not interoperable, then which is to prevail at intersections?

Actually, workers at such domain intersections will have to suffer with inter-domain switching and converting.

Notes

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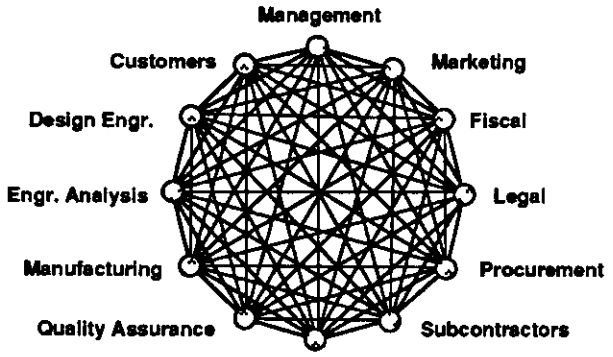
EACH FUNCTIONAL DOMAIN IS A CANDIDATE FOR WORKING INTERCHANGE WITH ALL OTHERS

Manufacturing Organization



Notes

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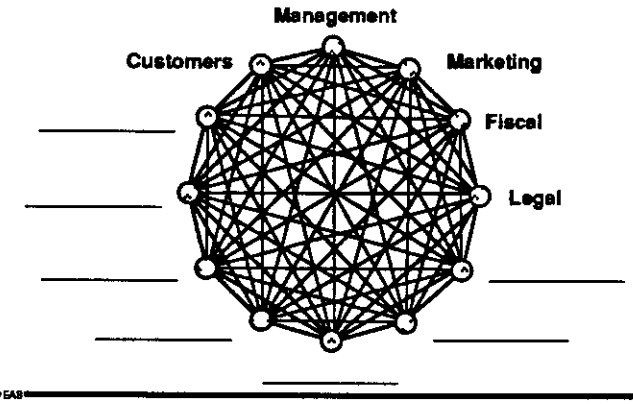
Your Organization



The most complex design, manufacture, and support challenge that we've contemplated -- for one of the planned new Air Force planes -- provides an interesting glimpse of the scale at which a future, high-performance CODIAK process will need to function.

Notes

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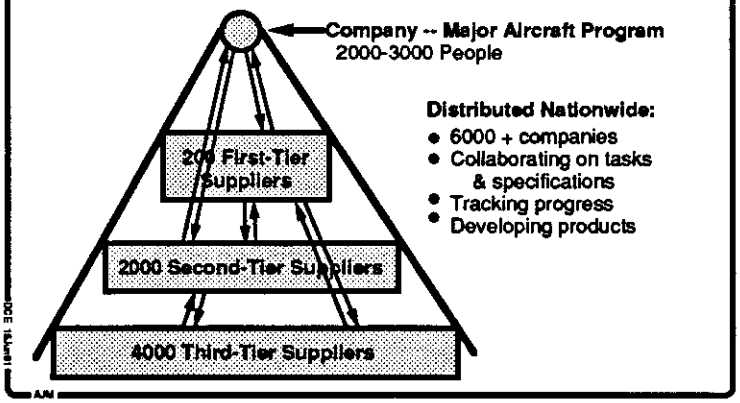
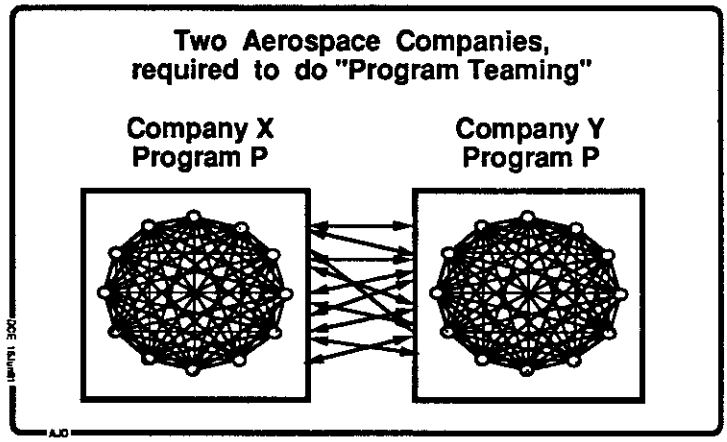
ISLANDS IN SUPPLIER HIERARCHY OF A MAJOR AIRCRAFT PROGRAM WOULD BE VERY COSTLY



Heavy manufacturing industries have been active in exchange standards for CAD models, and Product Description data -- and also for electronic forms of conventional documents. But there is little appreciation (yet) for what the future, basic CODIAK processes will require.

E28

CLOSE COOPERATION BETWEEN LARGE ORGANIZATIONS PUTS NEW DEMANDS ON KNOWLEDGE-WORK INTERCHANGE



Notes

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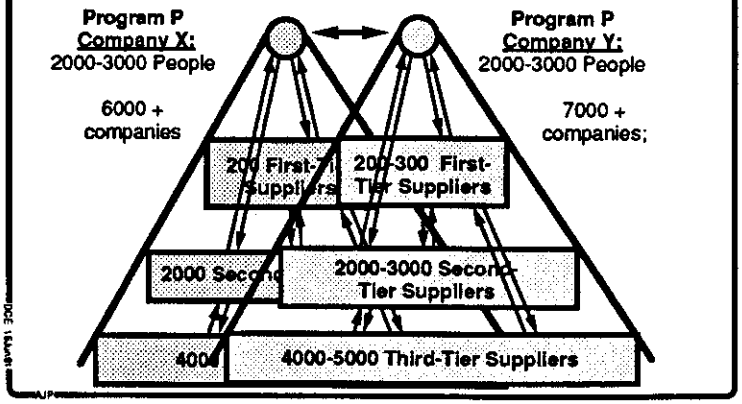
TEAMED AEROSPACE PROGRAM – IMMENSE DEMAND FOR KNOWLEDGE-WORK EXCHANGE



E30

WITH INTERLINKED CUSTOMERS AND SUPPLIERS, NO MAJOR INDUSTRY CAN AFFORD ISLANDS

A whole industry, with many inter-operating organizational units, is in itself an "organization" that has a functional "augmentation system" whose improvement warrants explicit evolutionary attention.

The "A Activity" of this organization will very much need a global OHS. Early prototypical OHS capability for its C and then B Activities would thus be an immediate bootstrapping priority.

Notes

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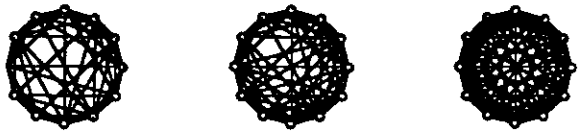
PROVIDING FOR EXTENSIVE INTEROPERABILITY WILL BE EXPENSIVE



A B C

Yes, but -- how much more will Interoperability **B** cost than **A**? Or **C** than either?

Then compare the value of Interoperability **B** versus **A**; or, **C** versus either.

Notes

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Hypothesis #4: Collab. Knowledge Work (CODIAK)

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COMMON PROBLEMS WITH PREVAILING PRACTICES

The CODIAK knowledge base represents a valuable corporate asset, but many of its crucial elements are generally *not* recorded.

Even minor inadequacies in the CODIAK process can be extremely costly:

- slip-ups in version control
- lapses in project "memory" (e.g. design intent)
- delayed access to critical intelligence
- non-optimal collaboration on design decisions

Notes

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SERIOUS CONCERN

More and more of our CODIAK work is done:

- concurrently
- online
- distributively
- using a *hodge-podge* of workstations, networks, applications, and utilities
- with point-solution software
- using poorly developed Human Systems

This could seriously undermine our whole CODIAK capability.

Notes

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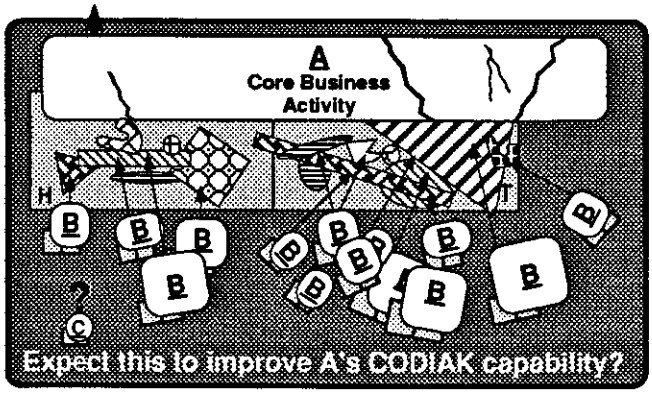
B's WITH NO COHERENT SHARED *CODIAK*, NO STRATEGIC INTEGRATION, AND NO SUPPORT



E36

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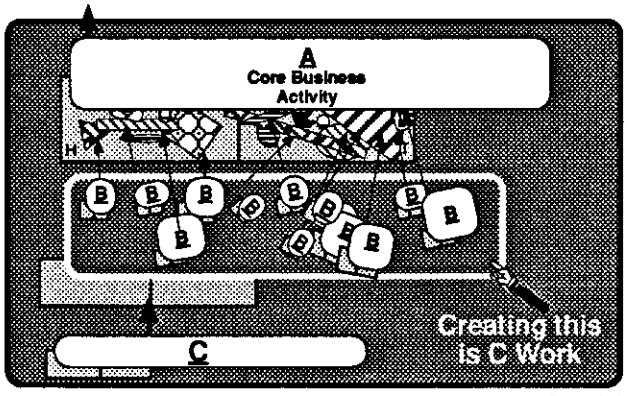
C PROVIDES COHERENT KNOWLEDGE BASE TO SUPPORT MORE EFFECTIVE, INTEGRATED B



Notes

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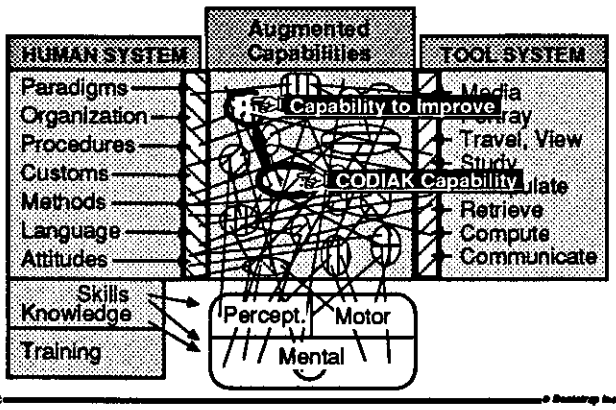
CODIAK IS A CORE CAPABILITY ON WHICH MANY HIGH-LEVEL CAPABILITIES DEPEND!



To produce a really significant improvement, a B-Activity must design and implement operational dynamics requiring many changes in skills, roles, methods, tools, facilities, working relationships, team discipline, performance metrics, knowledge configurations, etc.

Consider the many different stakeholders, disciplines, sub-projects and knowledge domains involved in the B-Work of designing and implementing such a large-capability improvement. There is fully as much need here for improved CODIAK capability as for a complex A-Work task (e.g. a product cycle).

This is why improving the basic CODIAK capability can be such a high-leverage investment.

Notes

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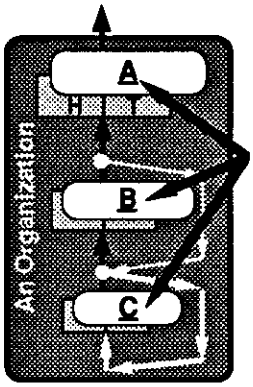
AUGMENTING THE CODIAK PROCESS OFFERS EXTRA BOOTSTRAPPING LEVERAGE



This is the most *direct path* toward high-performance organizations!

Well-enhanced CODIAK means faster and smarter capabilities for:

- Identifying needs and possibilities
- Designing and deploying solutions
- Incorporating lessons learned

Improving the *product cycle* and the *improvement cycle* offers special compounded leverage!

E40

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HIGH-LEVERAGE STRATEGIC INVESTMENT: IMPROVING THE BASIC CODIAK CAPABILITY

Warrants early C-Activity focus:

- other higher-level capabilities depend heavily on CODIAK
- CODIAK is important capability for A, B, *and* C work
- CODIAK is basic foundation for many B products

Need an ***Augmented Knowledge Workshop:***

- well-integrated tools and methods
- bridging across computer systems, organizational units, time, and space.

Later will discuss details of how to make this happen.