Bootstrapping Our Collective Intelligence

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Bootstrap Institute

and

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Sun Microsystems

presented at

Engelbart's Unfinished Revolution
A Symposium at Stanford University

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Paul Saffo's Introduction of Doug

Current work of the Bootstrap Alliance. Really important. Cannot emphasize it enough - this is not just a project where there are ideas from 30 years ago that the industry still hasn't figured out how to use. That is the case, but meanwhile Doug has 30 more years of ideas. This is a guy who works 12 hours a day on refining and perfecting the vision, and so while we're trying to catch up with a couple of decades ago, he's still racing on a couple of decades ahead. He and Jeff are going to have a conversation about that.

Doug and Jeff Presentation

Doug

First I should point out the role that Jeff has played in the past and the present. He was a key figure in the late sixties in getting our systems together and software orientation and helping make this presentation that you've been watching. Then he went off on his own trajectory for a few years. Then two years ago he started helping us get our bootstrapping ideas launched. He's been a very strong supporter.

The way this has taken shape is that nine years ago Christina, one of my daughters, and I set up this Bootstrap Institute.

The way in which organizations are going to have to go to do this is complicated so there needs to be a strategic approach. So, lets set up this Institute and raise the flag and say 'Hey organizations - there really is a way to get much more effective value out of this revolution". So, we plodded away for some years and got a lot of concepts - we'll show a few of them to you now to give you a framework for that. Then, two plus years ago Jeff and Martin Haberle said 'well, lets get going', so we started doing a lot more planning with people and a year and a half ago set up the Bootstrap Alliance, a not-for-profit structure that can start taking contributions and donations and participation.

[mispronounces participation, laughs, and says - I just have to tell you that this day is almost undoing me, so if I can be coherent for another 15 minutes we'll be in good shape! -]

Jeff has had a lot of experience in corporate structures and moving things and organizing things, and what we found out 25-30 years ago was that Doug can point to something like that but he's almost helpless in a lot of practical ways. So, if there are not people around that can really do things, it never gets off the ground. So, all that stuff at SRI - it took people like Jeff, Charles Irby, Bill Duval, Bill English, and [?] Sonia [?]- whole bunches of people that made a huge difference. In fact, sometimes they'd come to me and explain 'hey, there's this thing called remote procedure call protocol and we've got something like that really working now' so our lab gets credit for having an early procedure call protocol and somehow I get credit for it, and I say 'I didn't even know what it was'

So, Jeff is going to help me stay on a picture that we can really do something about and we've some specific plans and some really interesting things to launch with. Do you want to say something here?

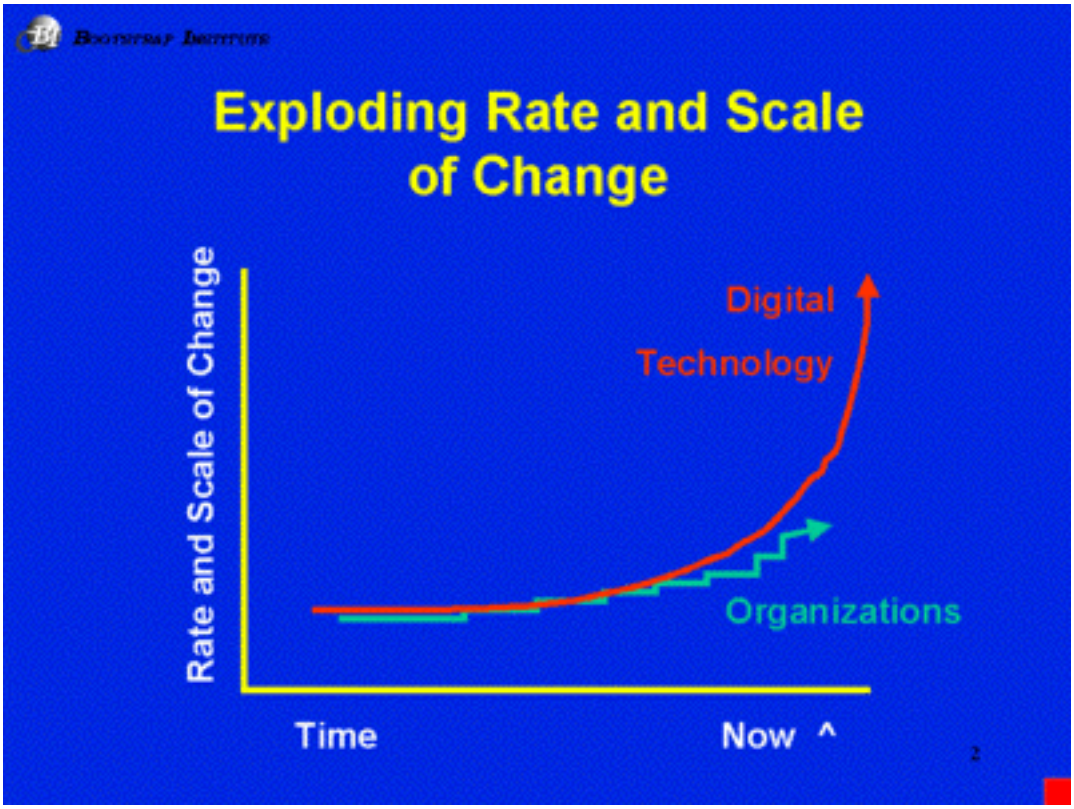
Jeff

Well, we've got a good two-three hour presentation here, and we're not really certain which slides we're going to show, but we're going to try.

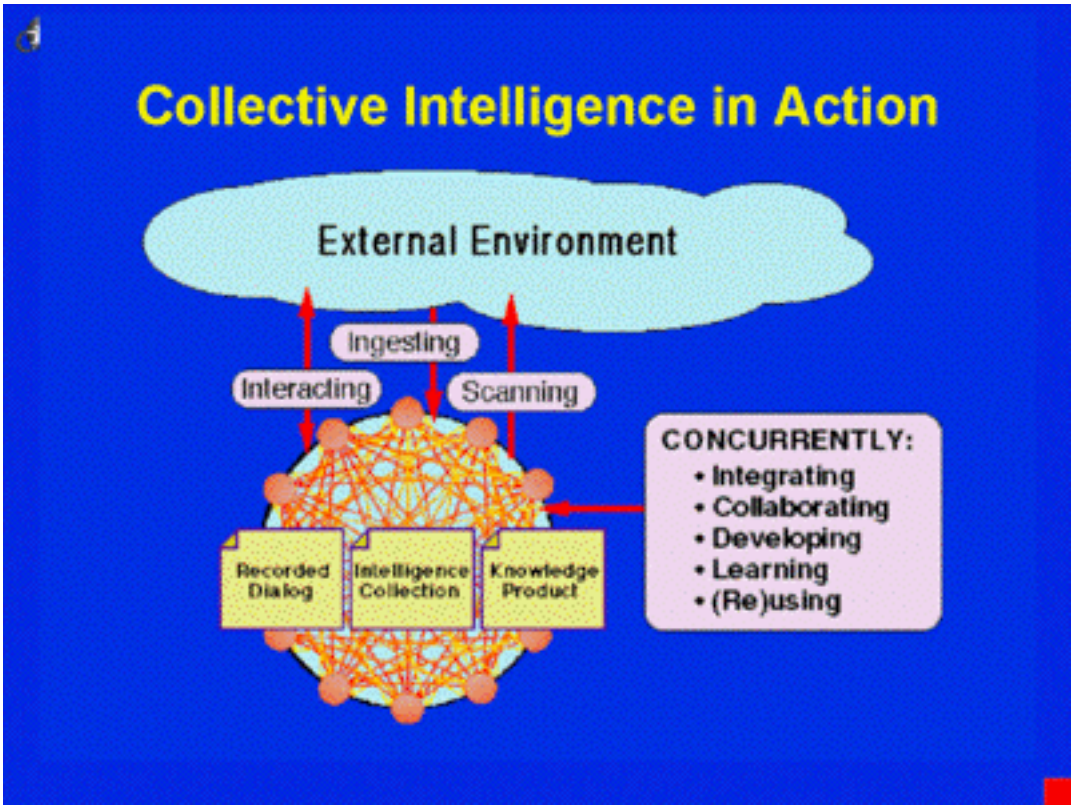
The SRI lab really was a pilot program, I think, in Doug's terms. What we've been trying to do with the Bootstrap Alliance is to get other people to get their pilot programs going. I think in one sense that Doug's vision of the future is not a vision of specifically where you are going to be or which devices you are going to use or what not. Its a vision of getting a process going that puts discipline into this evolutionary idea. So, if you'd go ahead and talk about pilot programs some and get us into that, then we can talk about some specific examples that we've got that are actually getting going.

Doug

I can't resist showing you some of the pictures.



One of the things we've been hearing a lot about is 'OK, a revolution's coming', so one of the problems is how do organizations accomodate the changes that are coming. Up to now they've been sortof doing it, but now its taking off so there's a huge challenge there for doing that. One of the big things we talk about is the potential of a kindof collective intelligence.



If you look at something that you could call a social organism, an organization, and drew an envelope around it and watched how it interacts with the outside world, you'd pretty soon be able to get some sense about what kind of IQ it has - like how well it understand what's going on, how quickly and suddenly does it make a decision, how well does it marshall resources and how smart a plan does it make, and ... how well does it learn what's going on and how well does it generate new knowledge, creative IQ.

So, the whole potential here that's been driving me for all these years is that there is a really significant improvement in this collective IQ that's there to go after, but the way the market operates now we won't go after it.

That's one thing. And a big part of being collectively smarter is to have a dynamic knowledge-base, knowledge repository, that isn't just a digital library but something that's dynamic - its keeping track of the outside world, its keeping track of what goes on inside, its always keeping as up to date as possible so we can go to it and say 'what's the summary now'. Its like having a constantly updated textbook, or handbook about the state of things. This is the sort of thing that professional and academic disciplines are going to be like some day - much more dynamically up to date. Organizations can too. The potential is there; it's worth going after full-steam, so we're saying all right, that's the kind of push.

Jeff

Go back.

Doug

I can't go back [laugh]

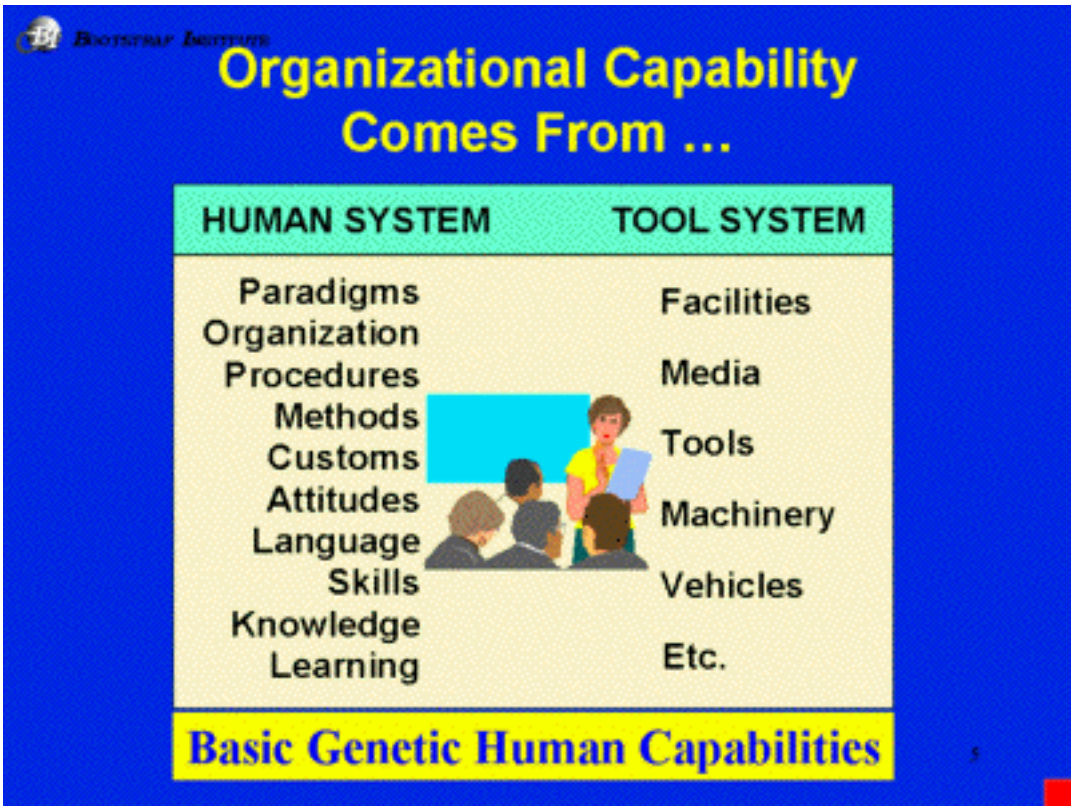
Jeff

So even back in the films that you are seeing, the pilot program at SRI wasn't doing this about just anything in the world, but in fact was attempting to build this kind of dynamic knowledge repository and tools about the things that we were building. That is, the core focus here, to really get the leverage going, was that we were building tools and building this dynamic knowledge repository about our tools and our dynamic knowledge repository. Even today its very hard to get any sort of people doing software development to do that, but it was a key focus in what was going on here.

Doug

You see - I really need support and people to steer me. So I should say, thank you Christina for keeping on steering me and all those other people too. Christine is here and so is one other daughter and I think my son will be around - so if you see another Engelbart, placate them and say 'Great' 'thank you'. You can't be single-mindedly staggering along year after year and really do justice to being a family man, so that's why you can placate them...

One of the things that fundamental here is that how does an individual or an organization that's got some capabilities - that's a very important aspect to look at - where do they stem from, the capabilities. They stem from the basic human genetic capabilities.



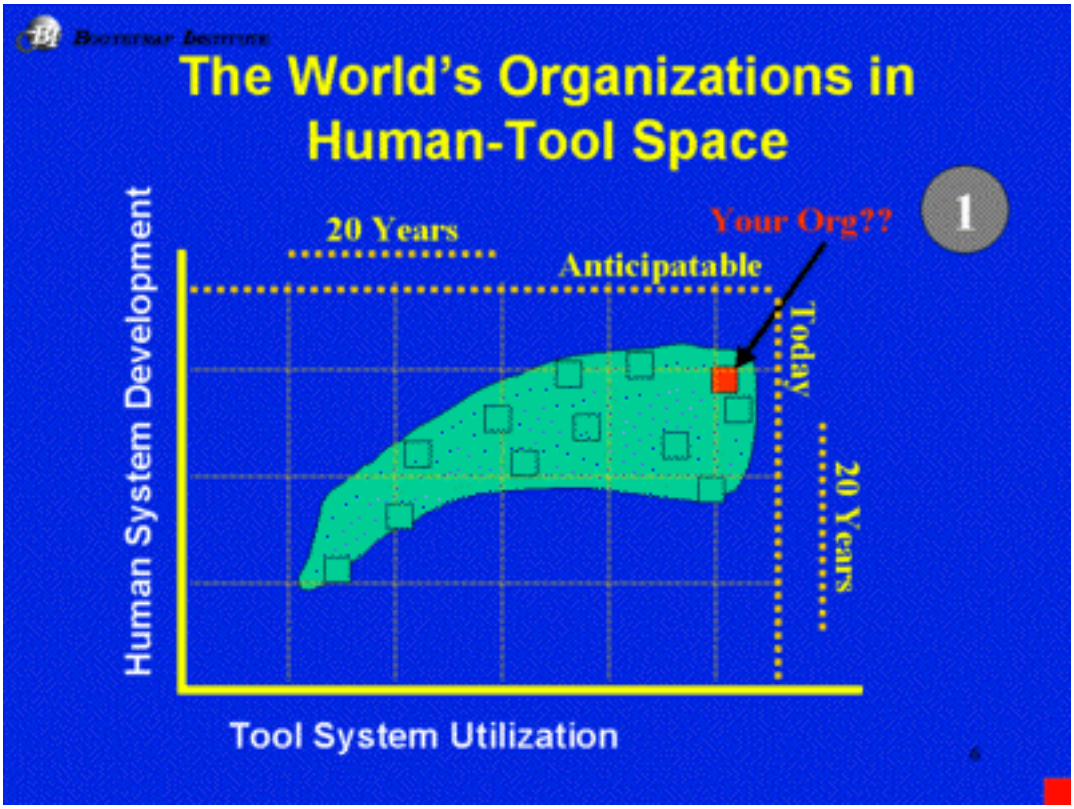
So, you bring in people who've been born but they have no training or conditioning or equiping or anything. Are they worth anything in your organization. No. So we provide them with a few things - facilities, tools, machinery, vehicles, etc. etc. We call it a tool system. So, absolutely, they need all that in order to be effective. Like we're sitting in chairs and we've got facilities and ... Then the technologists say 'OK and then we bring in computers'.

But, wait a minute. There's another part of this that it takes to make people effective. Its the paradigms they live by, the procedures they follow, the customs they use, the language that they employ, the knowledge... All of these are added on top of the basic genetic capabilities. And ... There was no name for all of this, so I just crudely coined the name human system for that. I'm still looking to see if there is any other term for it out there in the world.

It takes those two things [tool system and human system] to be integrated for humans to be taught, conditioned, trained, etc in order to be effective. That's all built on top of the genetic thing. Motivation and all that.

Someone says 'I'm going to improve their effectiveness. I'm going to invent some gadgets here and plug them in'. There has never been an effective gadget that was plugged in over there that really made a difference until the human system adapted to it. So big changes there cause subsequent very large evolutionary changes in the human system. You've got a radical, explosive change like the digital technology and he says 'Oh, I'm going to use it to automate things over here, huh?" So this was the prevailing thing in the '70s. But that just can't be.

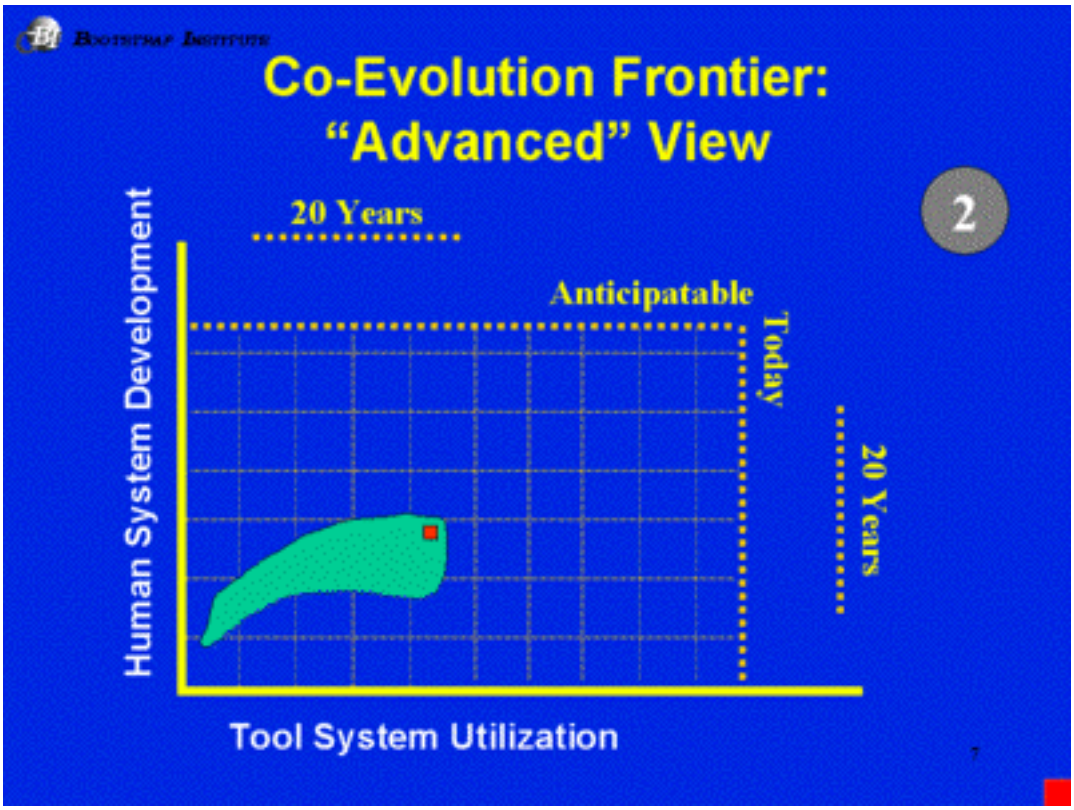
What happens is that the left-hand side, the human side, has got to co-evolve lots of new ways in which it does things, in which it harnesses basic human capabilities. So, we're talking about revolution like we've never seen before and it isn't going to be like you just sit there and have the equivalent of a document on your screen and you scroll it. That's not using anything of the computer capabilities or what your mind and your sensory and perceptual machinery can work with. There's a revolution in the making but its not going to happen unless we find ways to co-evolve those two things.



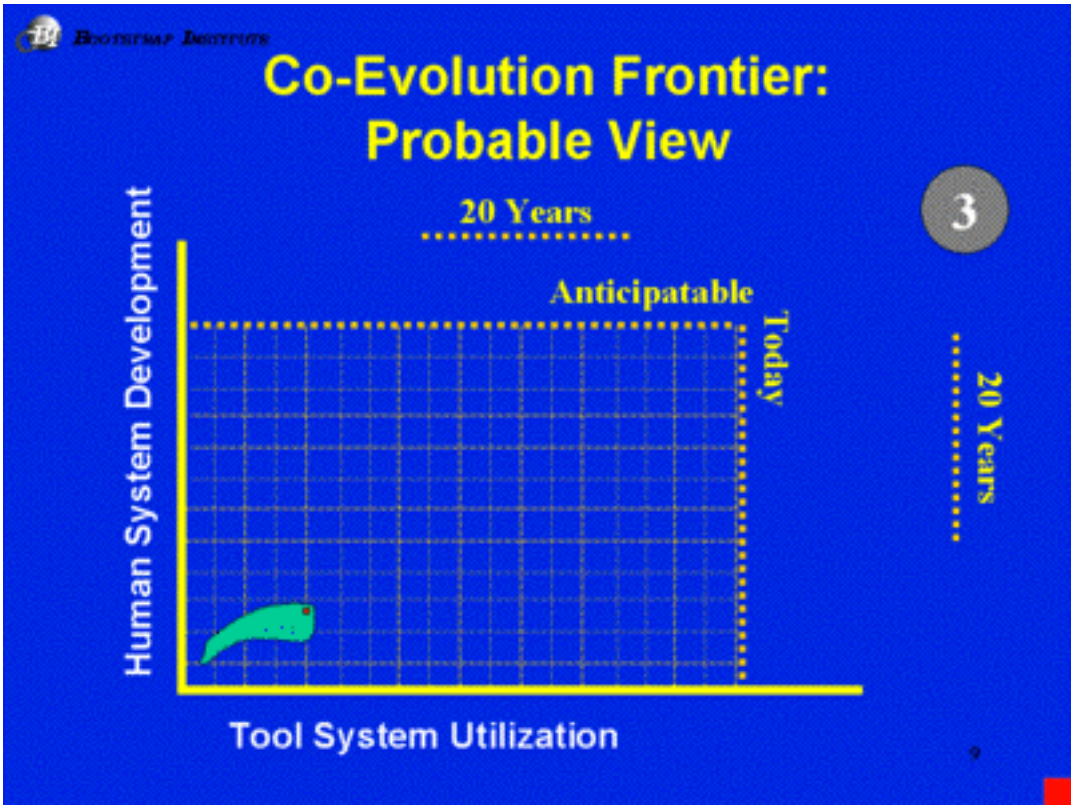
So we say, let's think of the equivalent of a frontier out there. The human system and tool system, some combination of those for any organization and you say 'well there's a fairly primitive organization or society, well there's somewhat less primitive, well they're more, etc.' So you start going around the world and cataloguing them and trying to measure them on here and you find that they spread around in some interesting way. When you finally get

to your organization, and since you're modern and well-equipped etc. you know you're going to be right up there, right? So then you sit there through the years and you're saying 'we're evolving and we know we need to move more towards what we can anticipate in the technology and tool systems and up here, yeah, we're doing ok. We send people to conferences and once in a while we hire a consultant here and we're moving in that space. Right.

So, then comes the revolution, see.



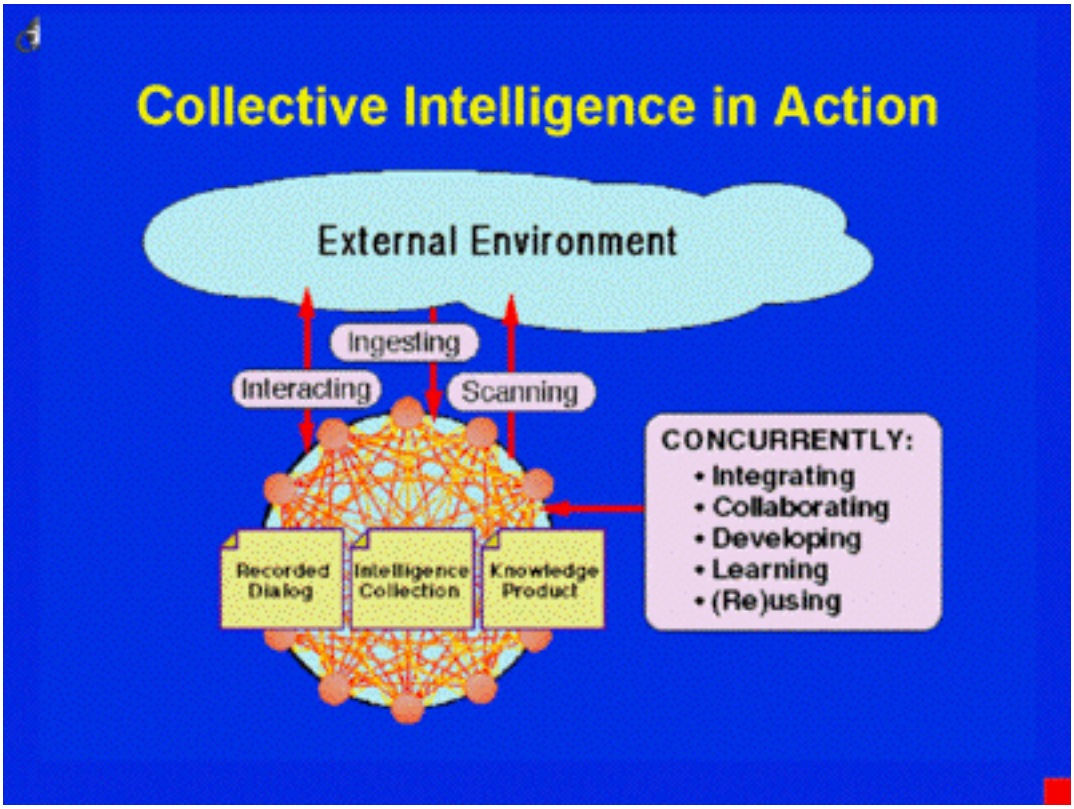
Well, if that's the basic envelope, wait a minute, well maybe its more like this. This revolution has sneaked up on us and boom, there's this much change coming on there. Oh, now we have a different challenge from ever before for moving out there. And he says "well, ok, that makes a difference, doesn't it. How do you get the scenarios, how do you scout that frontier, how do you learn how to move through that much new space?



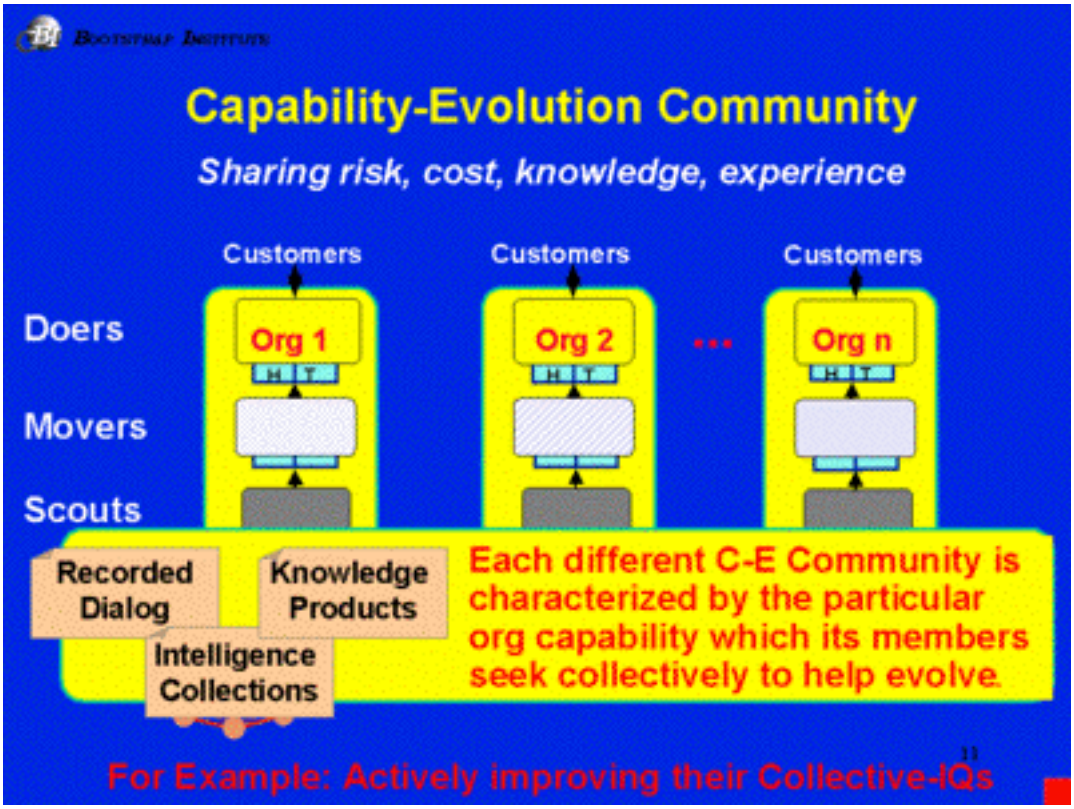
So then you say, "wait a minute. If its that much difference..." so now you take to Engelbart and that's what he says.

{{laughter}}

See, if its stage one, then you've got people who aren't going to worry. For stage two, "well, its happening, and the marketplace is going to help us adapt, etc." So that's the big story like that and you think of this thing and you say "Hey, whatever mechanism and infrastructure I had in my organization that was moving me out on that frontier is likely to be very inadequate now. When I was scouting it we didn't have to have very much scouting time when it was moving so slowly. Now that becomes a huge factor. And then we didn't have to have so much special energy, the budget for moving our organization didn't have to be that high. But now you've got to get big budgets and really know what to do. So the scouting and the moving are something that is very important.

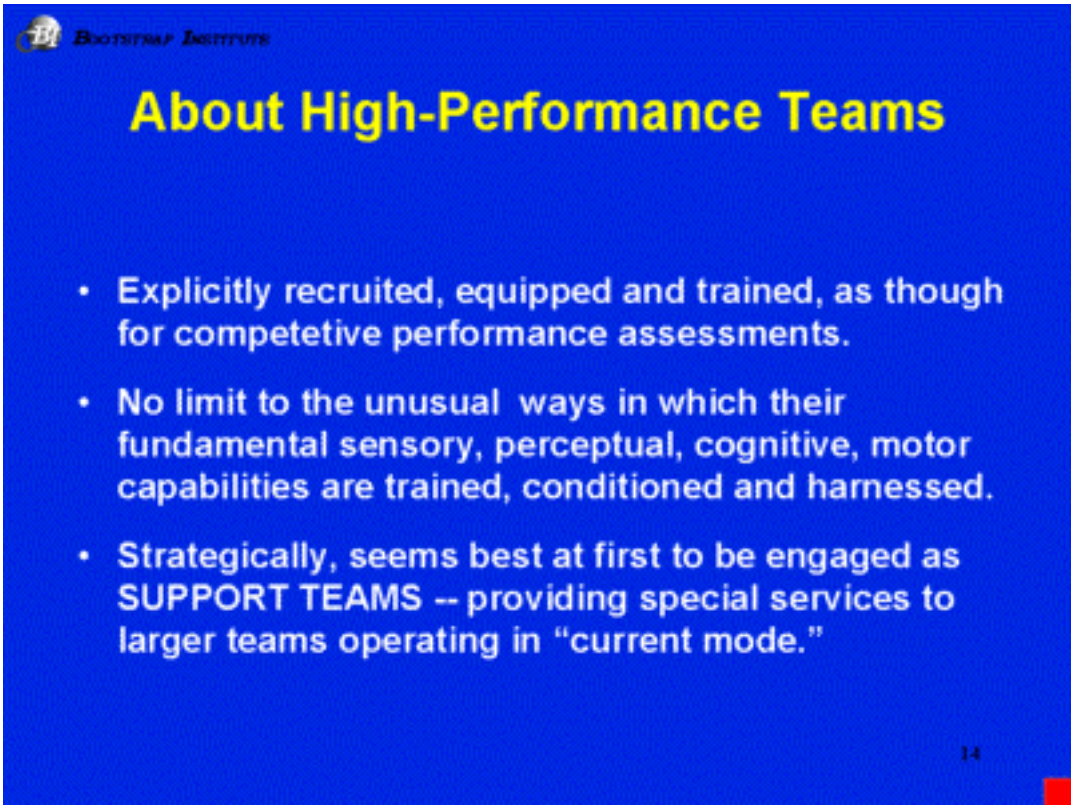


And then we talk about, if you're going to get smarter and better collective IQ, you've got to look at your social organism like this, say, how does it work. And judging from its deals in the outside world, and its got to have this repository. And he says "OK, the dynamic shifting of that is a key factor in there.



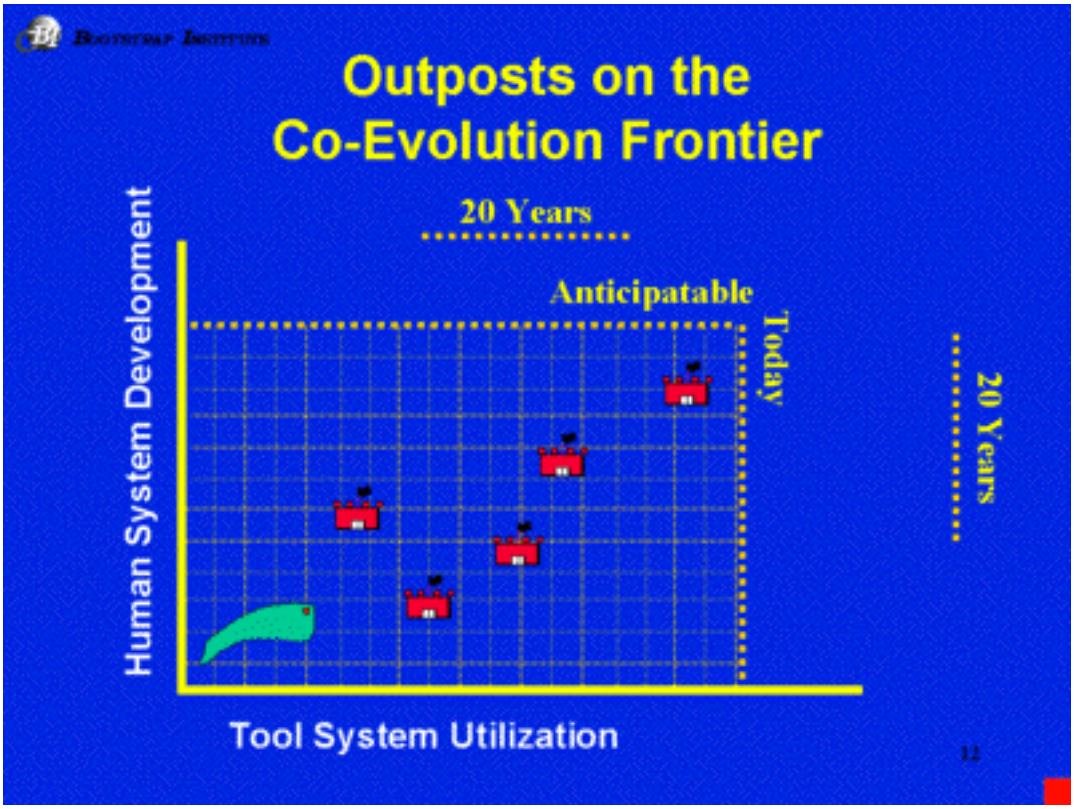
So then he says "Oh, we've got a bunch of organizations together - we've got the organization doing its everyday thing, we've got activities in there that are trying to move the organization in space, we have some scouting activity, and look at the payoff if we get them together in a community that's helping each organization to move along a certain capability improvement vector. So that's the idea of these evolutionary improvement communities that we got started. So the Bootstrap Alliance is in the business to try and help that kind of institutional new way to set up for evolving. We call it evolutionary or improvement infrastructure. So that's the scheme that we're doing now.

So you want it to operate in a really prototypical advanced way too, with this dynamic repository of tools. So its a great chance to have advanced prototypes that work. Which leads to the whole thinking about advanced prototypes. And he says "OK, this thing is going to go, so high performance teams is something that you want to think of.



To get them to work you say 'your're an explorer, we ought to explicitly recruit, equip, and train as for a competitive performance assessment.'"

That's a brand new thing to dump on you, but that's basic in there. If we don't find ways to pursue that, how are we going to get learning about that frontier? Just invite them to be really far out and different, and strategically it looks like the best place to employ them is as support teams inside of other organizations. They can be helping other organizations, but specifically this evolutionary community.



So all of this is part of a framework and its like saying 'in that frontier, we've just got to find ways to get outposts that are for real, that aren't just toy things. We've got some more technology and we can try it out with some people for a while. So strategically you've got to find out ways in which you can get advanced configurations of technology, not just one advanced gadget that's out here that doesn't change the.... If you're going to try that human system balancing thing like that you have to have pretty much a whole working thing. So this leads to saying they should be part of a bigger activity to do their high performance thing in support of that, and then you come to things like saying, Oh...

Jeff

Can I jump in and talk about the outposts.

One of the visions that goes all the way back but has really struck me now that I'm at Sun in the past ten years or so, is that the science to do the tool systems is really sortof easy. We can build gadgets faster than even we can consume them. The science to push the human system development, from what I can tell, just isn't there. There's no disciplined way to go and get on these Moore's Law scaling curve things. So I think one of the key ideas Doug's had in this is that the only way you can make a progression of the diagonal on this is through these pilot programs. To actually have experimental programs in the real world doing real things trying to push both dimensions simultaneously. In a way, its that disciplined pushing of the diagonal which I think is the part of the revolution that isn't going very strongly.

Doug

true

Jeff

We're going to talk about a couple of little things that we've got that are starting.

Doug

You've no idea of what all the years of thinking and planning and knocking on doors and such. For me that absolutely unusual mind-blowing thing for Paul Saffo to put all this together today, to feel the energy, etc. Its just overwhelming. So we hope we can show some things about how 'Hey, there's an environment there we enjoyed participating in, and in particular the dynamic repository that any improvement community wants to do . Its the kind of thing where we say we need significant scenarios of the future, so if you listen to the next five guys talking today and just say "Oh, wouldn't it be nice to take their visions and start integrating, cultivating them, and then cross-integrating them, etc. and then bring in others until you get a more and more coherent picture of what feasible futures might be. If we don't, there's no way to make scouting or mapping this thing. So you start doing your intelligence corrections and then you start doing case studies and then you start encouraging more and more of these things so we really can learn

Jeff

Its actually taken us close to a year, but just last month or so we had a very exciting thing - Bootstrap Alliance Japan kicked off. In fact Professor Oshii is here some place.

Doug

Would you stand up Professor Oshii

Jeff

There he is - over here.

{{clapping}}

Doug

Make a point of meeting him later.

Jeff

So, its really wonderful. A number of people over there have organized and they've formed a separate chapter of the Bootstrap Alliance. They bring a lot of very differen Japanese values to this which is great because they are very different than ours. They are actually, I think, in your terms - you can talk about this - getting into this notion of bootstrapping. Its a project where its about documentation and how to make the vast amounts of documents indexable and linkable better. Using the system in the development of the system. So maybe you can say a little bit about relating that to bootstrapping?

Doug

Sure.

You say 'I've got this infrastructure that is setting up there to help improve the capabilities of organizations. Well, if some of those things improve capabilities that the infrastructure could use to improve its ability to improve, then the

better you get, the better you are getting at getting better. Isn't that simple?

{{laughter}}

So you say, why use a term like bootstrapping? Well its been used many years before by people - when boots had straps up here {{points at his leg}} and were very hard to put on, peole would joke about you could hold them and lift yourself up in the air. I heard about that when I was fourteen and I thought 'Boy, that's clever". Anyway, there are bootstrapping circuits and also when computers started to be used the term bootstrapping was applied to when you turn on the computer and it has only enough memory to start and reach into the hard disk and bring in more to start the computer. Its booting, the term booting came from bootstrapping.

Jeff

So, in working with Japan you understand that they have a different notion of quality control and improvement than we just don't have in this country. In a way I think that resonated with them a lot because there is a view of this - if you take a sortof simplistic view that we are improving the way we improve the way we do things, and if what we focus on in this highest level improving the way we improve the way we do things is the improvment process, then we are really into a bootstrapping paradigm, way of thinking.

Doug

My formula is if I keep pointing long enough I'll get people that are competant to start going there and getting it done. Its a funny joke in that I'm a very poor organizer but I've been very lucky in the past so ...

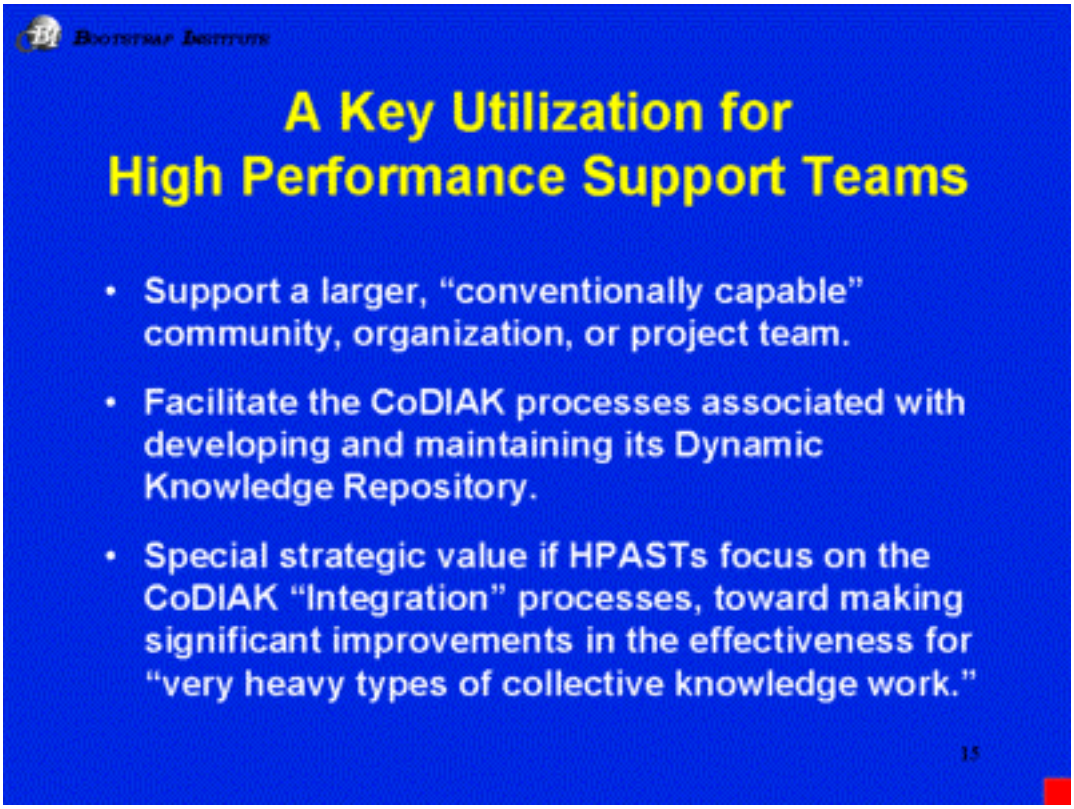
Can I show some more?

Jeff

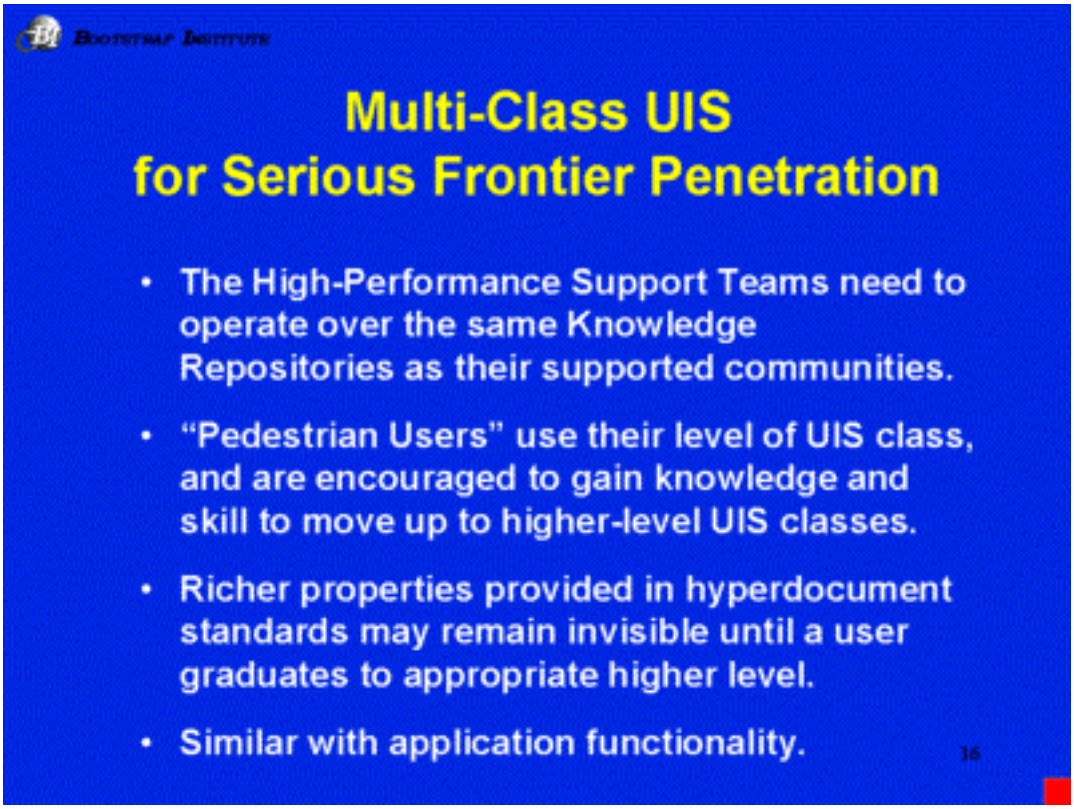
Sure. I'm watching the time.

Doug

I really need people like that.



If you get teams that are really working to learn about high performance, you have them setting up doing their whole thing, their whole project by themselves, you're not really sharing or using them as a lever to pry up more. So, the there are a number of reasons would probably best be applied if you have them try to support some other community organization, especially in the middle of the dynamic knowledge repository. Developing and maintaining that would be a very important thing. The special value of that comes with the business of integrating the knowledge. So, anytime you're really up-to-date with a coherrent picture of what's going on this is easy to do. In other disciplines every once and a while someone writes a textbook. But the way things are moving that's got to be much more dynamic.



So you also say, 'I'm going need some of the same materials. And you then have one class of interfaces, and other people have others. In fact, it would be handy to have multiple classes

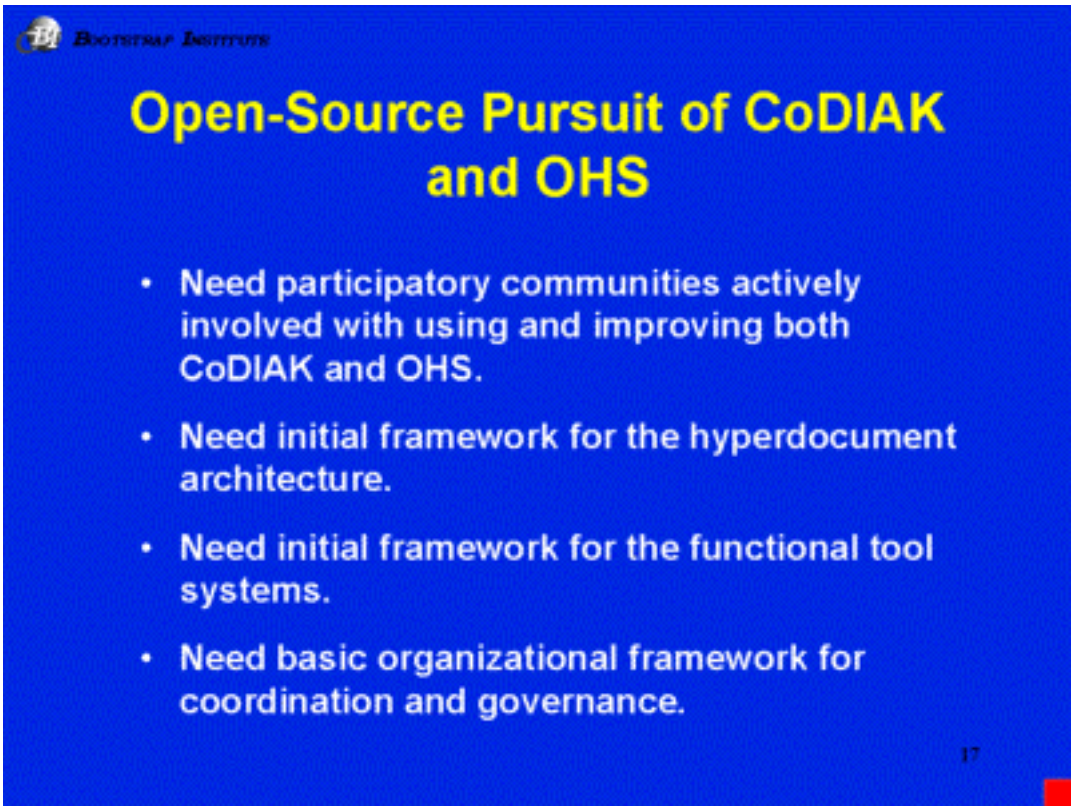
So, we started building that into the Augment System way back. With different classes, depending on how skilled you were you could have this kind of vocabulary or a simpler one, etc. That and the interfaces all need to be done. We are proposing that as a basic part of the architecture of something that you have to call Open Hyperdocument Systems.

But then you say "How would this go into the universities?"

Well, the equivalent of a High Performance Support Team would be a High Performance Scholarship Team. So any discipline is something like that. How are you going to keep up-to-date? Less and less can you depend on the aperiodic way of the appearance of a textbook. This sort of collaborative tools and processes could make that really up to date.

So, weekly, daily, how often do you think we should update that? Those are all part of the future.

So here comes where we talk about specific projects that are kicking off.



{{CoDIAK - Concurrent Development, Integration, and Application of Knowledge
- these are the core capabilities for collective intelligence}}

So, actually people may not realize it but Doug is extremely active today, continually pushing to get organizations involved. We've gotten a number of them involved in the Bootstrap Alliance - a couple of the ACM organizations, some government agencies... Its been sortof hard with companies, which is really interesting in a way if you try to work inside the corporations and understand why they have a hard time getting a pilot like this going, doing it inside their company.

One of the things that has just started recently is work that Doug started with SRI that has some government funding behind it again to in a way allow a number of pilots to start by starting an Open Source movement. Sortof a Java agent Open Source movenent program so that maybe we could get enough infrastructure put together on the software side so that we could even get back to some of the things that have been in his systems over the years, but do it so that we get a number of different pilots going rather than just the one, so that we get this diversity back.

Personally I feel that a path that we've gone down in the use of computers was the easy-to-use, GUI interface, mass population stuff has just ruined innovation in this whole field.

{{clapping}}

So maybe we can get some back again. So you talk more about this.

Doug

This is great!

{{laughter}}

There are things you look at, such as What-You-See-Is-What-You-Get. That was something that came up and people were very proud of it. Well for a while it was good technology, but that became anchored into a sign of quality of something when it really is inhibiting very much trying to learn how you can really change the views and chips. So, this is one of the things the higher performance teams could just break loose.

Jeff

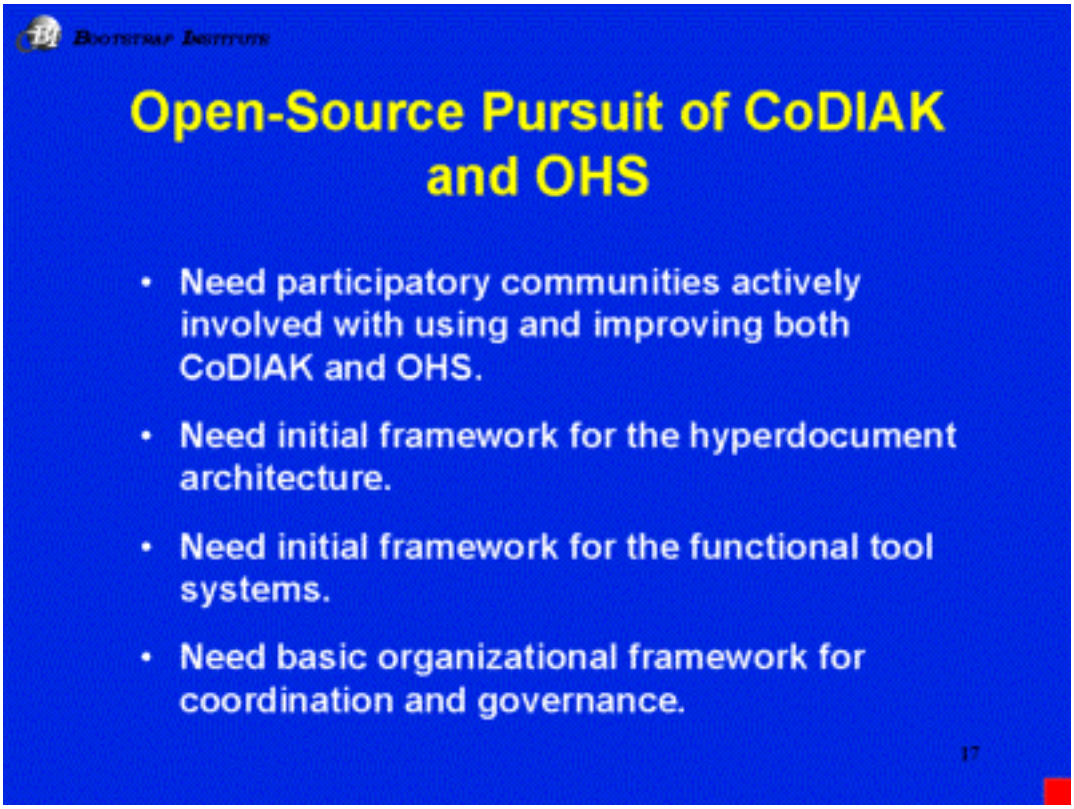
I think this idea carries through in a lot of your concepts. If I'm going to have a tool that I use a lot - not if I'm just a casual user that uses it just a few minutes a day - but if this is my life then it ought to be something that's tuned to me and that is extremely useful. In fact, we were reminiscing in the back room and I think the '68 demo actually had 512 single keystroke commands which weren't hard to learn. When you use this thing 12-14 hours a day you actulally knew them all. And it made it go a lot faster.

Now to make an analogy with what we're talking about today, that's really down at the gadget level. I think that one of the ideas you had is that you even start changing your language and the words you use to refer to things. So you start talking with each other differently and writing differently about it. So that there's an evolution across the whole spectrum of the tools that you have, not just the gadget tools.

Doug

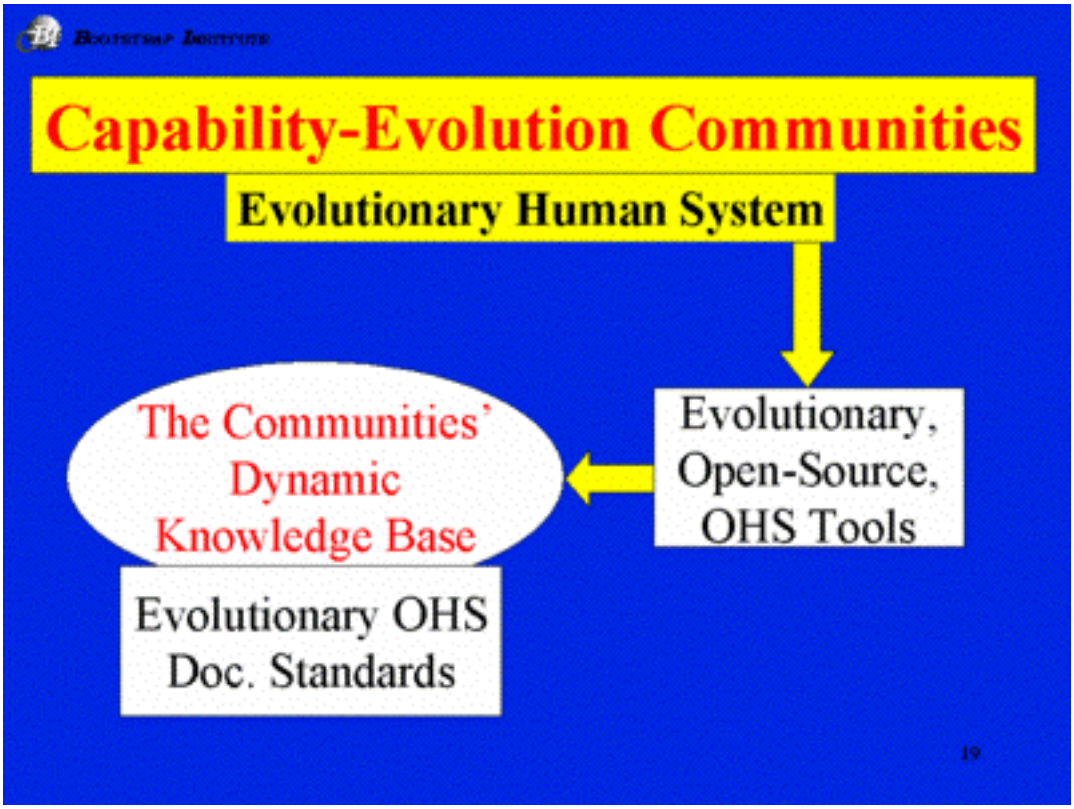
There's hardly any really effective collaboration thing without conventions that you adopt together in the way you do things. In this case the conventions were what you tag your links, and you point to things and just a whole bunch of stuff that just grows, what kind of properties are embedded in the document so that the simple kind of ones everyone has now would probably get more rich, and the sortof straightforward pedestrian kindof user interface will just ignore that and the higher class user will be able to try to manipulate these things.

Jeff



So this open source stuff that we want to push on is sortof fun. Just recently we have an agreement with the Open Group, which is an open standard oriented body that actually comes equipped with all the rules and regulations and ways of joining and whatnot so that corporations can take part and stay out of the intellectual property locks that keep a lot of us from working with each other.

So we barely have a kind of infrastructure together so that maybe we can get corporations back working in the open source community and contributing things.



Well, when we talk about getting different capability evolutionary communicies going, one for instance might be leading on to how you do electronic commerce better, another might be how you do distance learning better, another how you do your strategic intelligence better. They go after a particular kind of organizational capability and they build a community that wants to help foster it.

So, the idea of having a multiplicity of communities all of them sortof probing their way into the frontier, actively, and you realize that if they start collaborating a lot that would help very much in mapping that frontier and in doing case studies, etc. So you want to get together in this kind of alliance and really invest in that kind of case studies, scenarios, experiments, exploratory thing so that everyone can learn more about scouting that frontier and more about what it takes to move into it. Then each organization can decide for itself how it wants to move - that is, what kind of changes it wants to do.

But without having more visibility about that frontier, Darwin's evolution is going to have a hard time going, because it would be very hard to see what sort of survival value there is in changing if there isn't more of that kind of awareness in here.

So this model is sort of the best we can paint out of what it would be like - that you have your communities and they have an evolutionary human system going on as part of their change and they need to employ open source, open hyperdocument system tools in order to work on the repository and that has to be based upon an evolutionary open hyperdocument system document standards, because those document standards have to evolve in order to provide more power for how you use them, the different properties and such that they'll have, and the tools need to evolve. So we look at what's evolving and we've got three things: the human system, the tool system functionality, and the document standards.

So they are all open - the human system, the open source for tools, and the open standards. The World Wide Web

Consortium has a very active standards group here, so if you have proactive organizations up here they can contribute a lot and they are all participating in the open source wave. So some of the communities will be ones that are actively involved in the open source code evolution etc. and they will all be involved with questions about the functionality and the way they're applied. So it looks like we're ready to take off.

Jeff has all kinds of experience. I've done the hard part - painting the picture - now he can do the easy part of making it real.

{{laughter}}

Jeff

To go back to one of the things we talked about this morning a little bit, the idea here is: If we could really get the pilots going, get the revolution started this way, that there's a scaling effect that comes in. I think that's part of the grand dream. So, to go through it once again, the idea is if these pilots were working right and the evolution was going on, then we would come up with ways of doing all of this so that if we had a group of ten people and they had a certain capability, infrastructure, integrated tools environment, a certain capability for solving their problems, then when we go to a group of 20 people, we'd actually have three times the capabilitiy, not one and a half times the capability.

I think part of Doug's grand vision way back was that somehow if we could get these pilots going and get this learning process going, the learning process would feed on itself, and we'd actually get this builtin scaling effect, and so an ability to solve our small problems and our world problems because of the scaling effect. So I think that his vision of the future is not about what kind of gadgets we're going to have and stuff like that or exactly how the Web is going to work, but its a project-oriented learning process to get this scaling built into this capability notion that we have, that we don't even have good words in the language about it. Its a vision of the future that often news reporters don't get into.

Doug

It's important to set up an evolutionary infrastructure that lets free evolution take place, and no one approach can dominate unless it really proves itself better. Then you move that into the commercial world and some vendor is approaching your organization and saying "we've got this really hot groupware etc etc etc that will make your organization just zing" and then you are supposed to say 'well that's great - can I come and see". "yes yes." So what they think you mean is that you are going to come and go into their demo room and have a fancy demonstration, and when you get there you say 'No, I want to see how your organization using this works so much more effectively like you told us." And there'll be this big embarrassed silence.

But you see, this is the sort of thing that user organizations should really start poking around - "why the hell should we buy from you when you haven't even sold the rest of your company".

Don't tell us how we get better, show us.