Presentation Date: 21 September 2004, e-Government Conference, Wash, DC
Session: 3-4, 11:15 am, Ronald Regan Building and International Trade Center

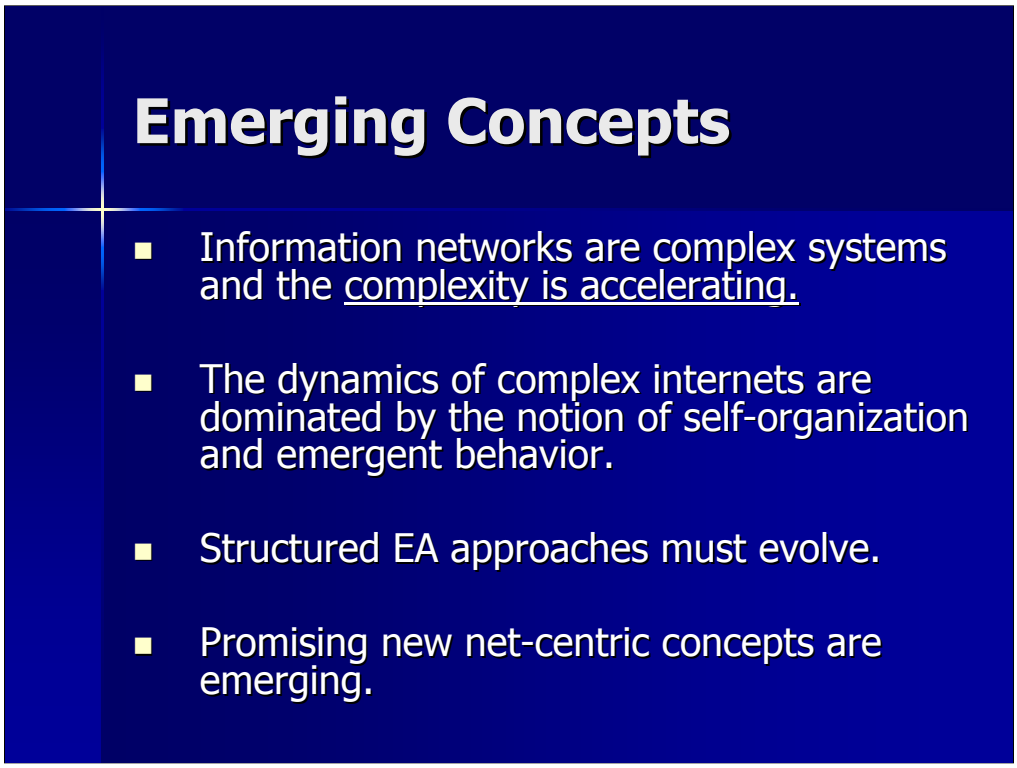
Leading Illustration:

How do birds flock together and fly in such a dynamic, ever changing and re-organizing patterns without an enterprise architecture?

In this 15 minute presentation, we discuss emerging concepts in net-centric architectures, including the concepts of using complex systems theory and biological models as a window to view the nature of complex information networks.

The notion of using these metaphors to help us understand the complexity of our enterprises has gained considerable visibility in recent years and is rapidly becoming the leading candidate to help us understand emergent properties of complex inter-networks.

Presented by: Tim Bass, President, Silk Road (www.silkroad.com)



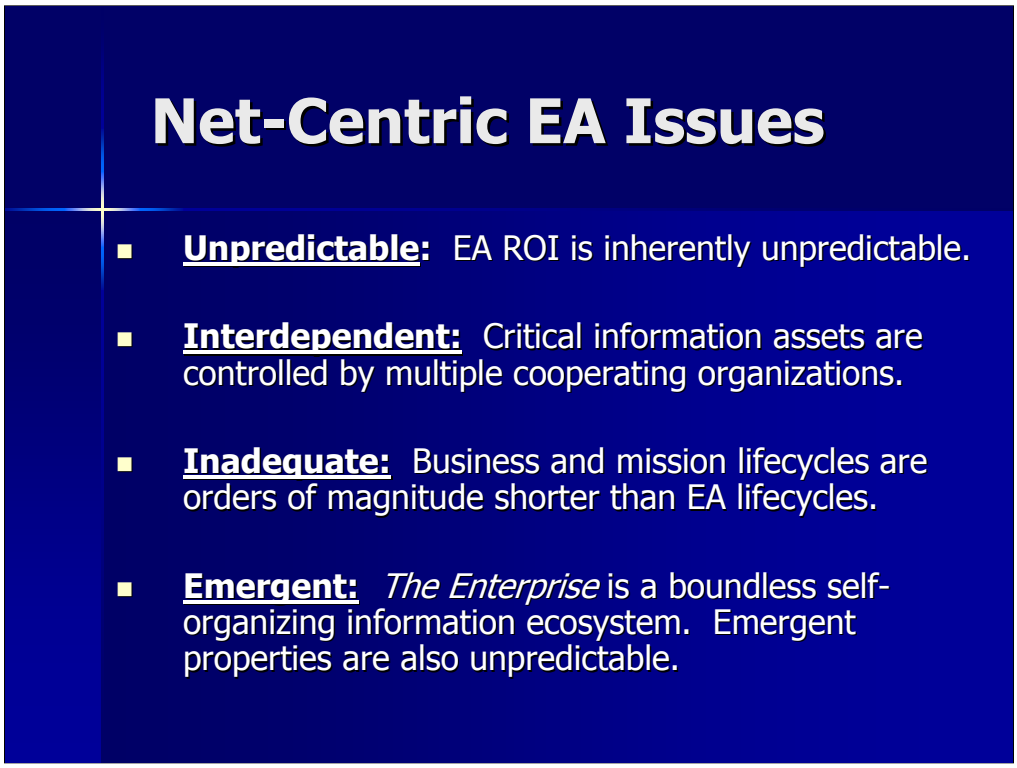
Complexity in our inter-networks is accelerating and at the very least, increasing. The way we do business changes with the changing dynamics of emergent network behavior.

Many well-respected researches and business experts have come to the conclusion that traditional approaches to viewing IT systems and enterprise architectures fall short in grasping the overall situational awareness and an understanding of powerful market forces.

Much of the research has gravitated toward the application of complex systems theory and the (unpredictable) emergent properties of these systems, including information networks.

When viewed from this perspective, traditional structured EA approaches are evolving.

Complexity theory offers a promising path toward understanding how net-centricity will effect our future and the future of EA in the net-centric environment.



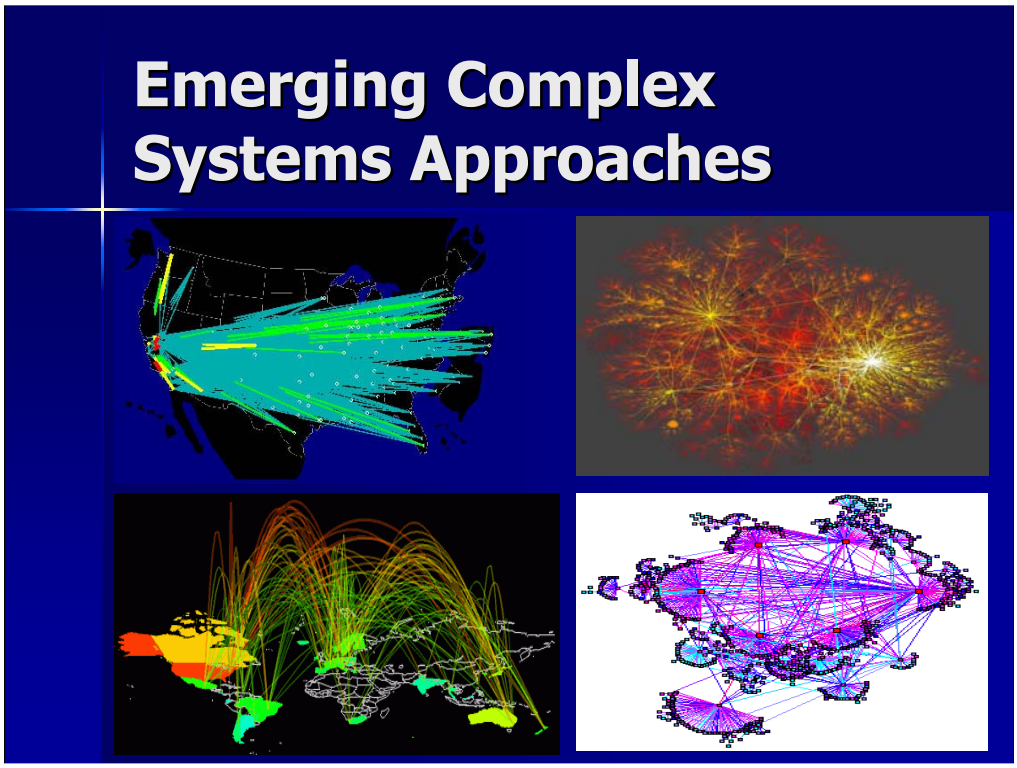
The dynamics of information networking is complex and unpredictable. In most, if not all cases, the return-on-investment (ROI) for most large net-centric capital expenditures cannot be predicted.

One of the reasons for the inherent unpredictable nature of these IT investments is that the net-centric environment transforms the very nature of business and human relationships. The health of one business is dependent of the health of other businesses. This interdependency supports the notion of 'business ecosystems' and/or 'information ecosystems'.

By definition, is not possible to predict the emergent behavior of complex systems.

This fact is further complicated by the fact that the lifecycle for many business and mission processes are much shorter than EA lifecycles.

How do we begin to 'get our arms around' this increasing complexity?



There is an emerging school-of-thought that begins to look at self-organizing characteristics of complex biological systems.

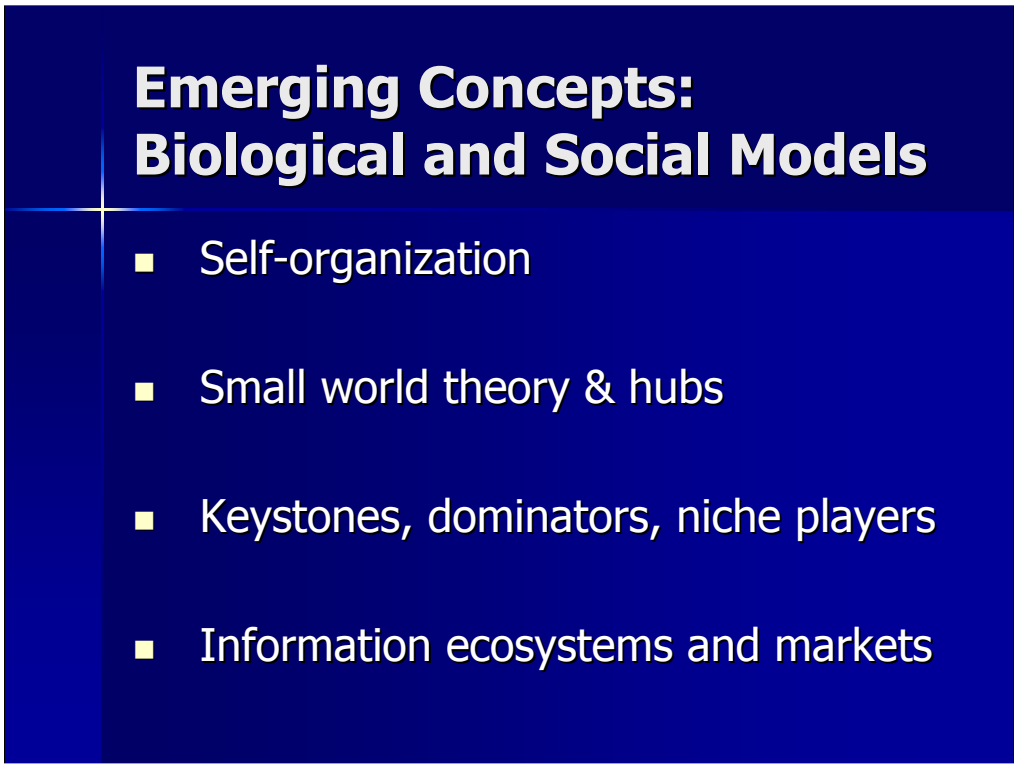
The figure in the upper left corner (Becker, Eick, Wilks) represents a ‘traditional’ view of network connectivity using color and line thickness compactly convey statistical data . The figure in the lower left hand corner represent a view of Internet traffic flows between fifty countries, as measured by the NSFNET backbone in 1993 (from Cox, Eick, and Taosong, 3D geographic network displays, ACM Sigmod Record, 25(4), 50-54, December 1996).

Note: Both of the graphs above represent traditional network connectivity and not complex information flow and business processes.

The figure in the upper right hand corner represents a view of the Internet in 1999 (Albert, Jeong, and Barabasi, Nature, 401 130 (1999)). The figure in the bottom right hand cornet represents the information connectivity of over 800 million web documents (by S. Lawrence, 1999) collected by a net-crawling software robot.

These colorful figures represent a small handful of a very large body of knowledge that attempts to understand the emergent properties of complex inter-networks.

Where is all of this research leading us?

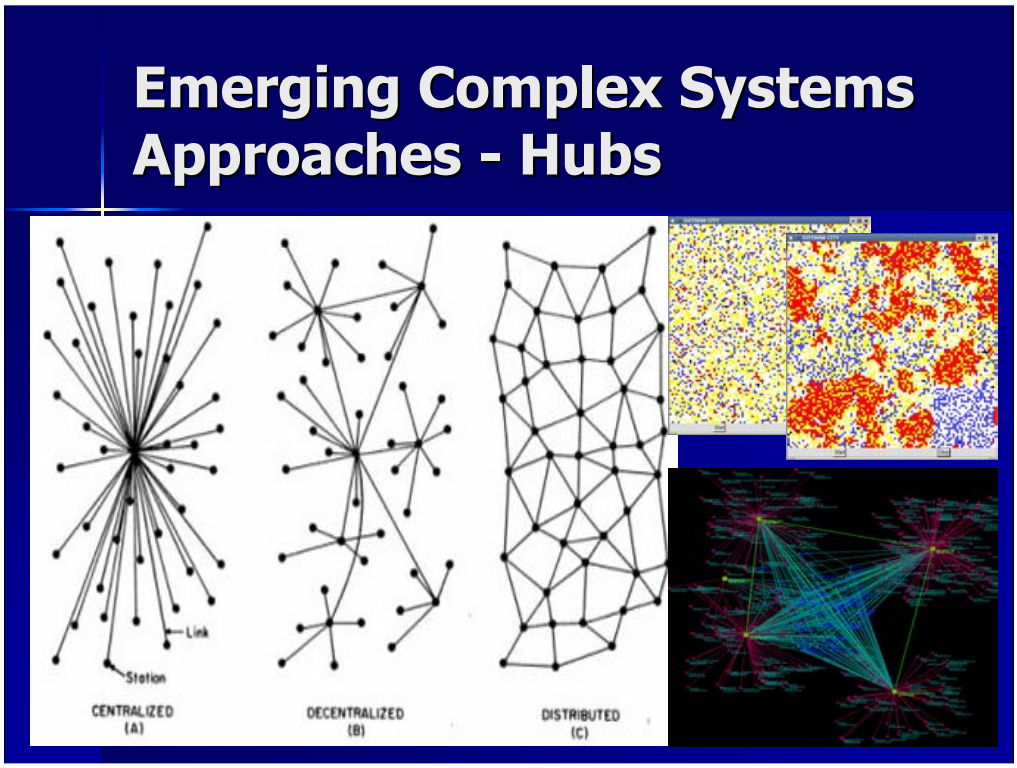


The leading emerging concepts for net-centric architectures are based on complex systems theory. They tend to look toward complex, self-organizing biological models (ants colonies, flocks of birds, genetics, insect swarming, etc.) to help us understand the underlying dynamics of complex networks.

Scale-free networks, small world theory, hubs in nature, business ecosystems, all of these schools-of-thought are thought to hold keys to our understanding of net-centric architectures. Subjects we can only briefly introduce in a 15 minute talk!

The concepts may seem a bit abstract and futuristic. On the other hand… the future is now! This helps explain why there is so much interest and research into the domain of complex systems theory and IT business models.

In a nutshell, and because of a lack of time today, these slides only scratch the surface in the state-of-the-art for concepts that are beginning to influence enterprise architecture thinking in the net-centric environment.

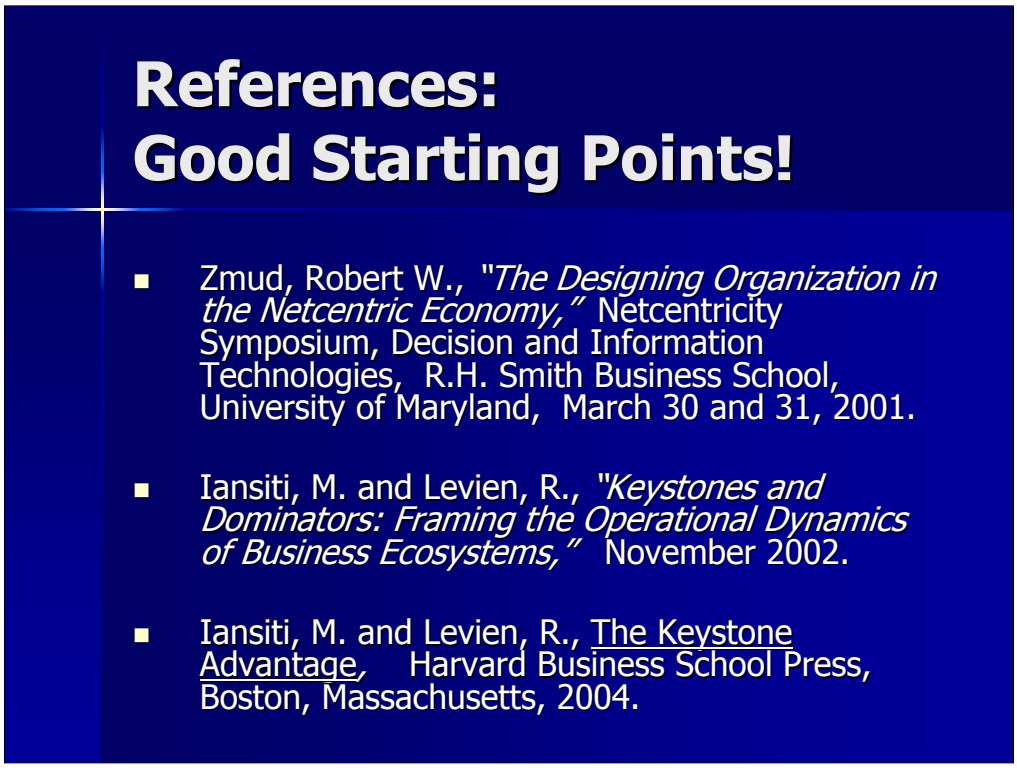


Baran's networks, the three textbook figures on the left, provide a basis to view the more complex self-organization that occurs in complex networks.

The figure on the upper right represents a model of criminal activity. These types of models are also used to help us understand emergent criminal behavior such as terrorism.

Must of the body of literature on the subject points to the importance of hubs, including naturally occurring hubs. In this brief 15 minute talk, we can only introduce the emerging concepts. We should realized, however…….

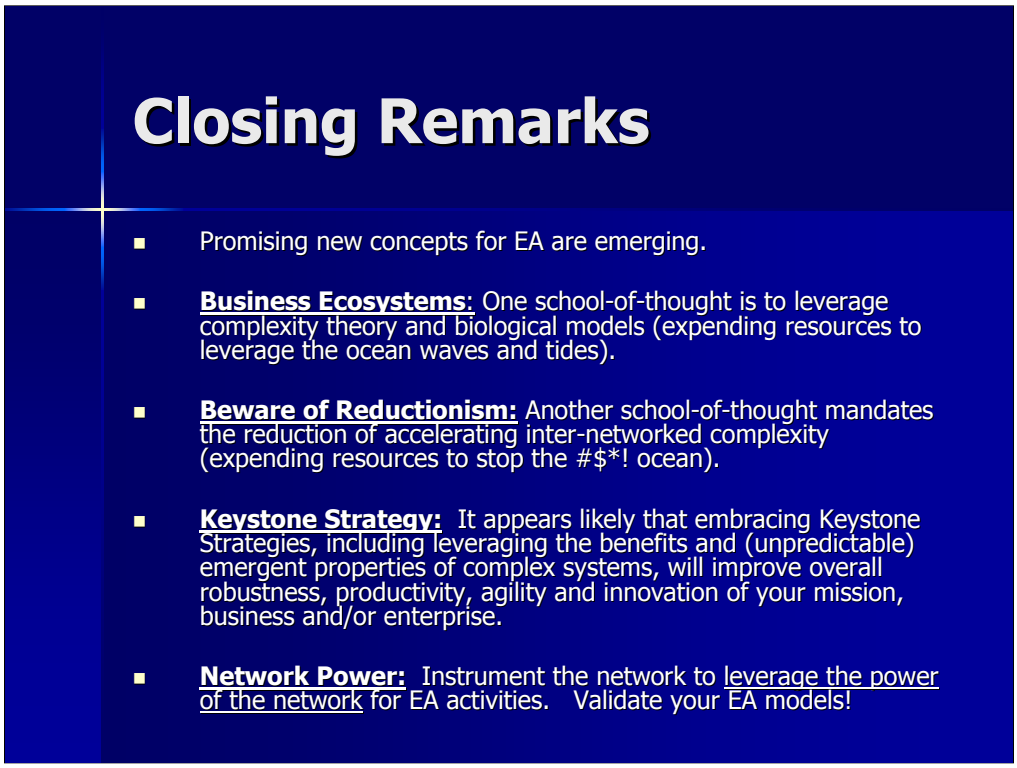
Complex systems theory and biological models help us understand the significance of naturally occurring hubs and how they effect business ecosystems.



It is only possible to scratch the surface on how complexity theory influences the future of net-centric architectures. For the interested conference participant, here are three excellent references that are a great place to start.

The first two references are available on the net in PDF format and can be easily found with Google.

The last reference is a recently published hardcover book, available from your favorite bookseller.



There are many concepts that are emerging that effect how we view enterprise architecture in the net-centric environment.

Lt. Gen. (R) Donahue reminded us the importance of a capabilities-based approach for the dynamic organization of information to effect outcomes.

Betsy Appleby provided us insights into how the concepts of complex inter-networking apply to sense-and-respond architecting in the net-centric environment and the DISA NCES program.

John McManus shared with us his experience instrumenting the NASA network to build and validate their EA models; highlighting the importance of validating EA models with network-based tools.

There are many emerging concepts for net-centric architectures supported by a large (and growing) body of knowledge in the application of complex systems theory to the business of IT and e-Government.

I hope you have found this topic of interest. I thank all the panel members for sharing their knowledge and experience with us as well as the conference organizers for inviting us to share this topic with you.

A copy of this presentation can be found on-line:

http://www.silkroad.com/events/

Thanks Again!

Tim Bass