Fractal Enterprise Architecture and Agent-Oriented BPM

Much progress has been accomplished in the field of fractal-based business modeling and agent technology for BPM. Thanks to my research assistant, Anuradha Potluri in Hyderabad, India, here are some annotated references. Your comments and suggestions are welcome: peter@peterfingar.com

Fractals in Business:
Fractals and Innovation,
Fractals and Business Processes,
Fractals and Supply Chains

In “How to simplify the evolution of business process lifecycles,” Alexander Samarin writes, “To achieve high flexibility in the business we want processes, services and other artifacts to be distinct and versionable, whereby each artifact can be evolved easily. We need to consider a business as a complex dynamic mixture of processes, services and other artifacts. The composition and the structure of this mixture are unique for each organization, but the structures share hierarchical, multi-layer and fractal characteristics (or patterns). Consider BPM as a portfolio of the business processes of an enterprise, and the practices and tools for governing the design, execution and evolution of this portfolio (BPM system).” http://lams.epfl.ch/conference/bpmds08/program/paper12.pdf

In “Fractal Modeling Approach for Supporting Business Process Flexibility,” Stecjkuka, Kirikova and Asnina write that the ability to support various business models has been recognized as one of the essential competitive advantages of companies operating in global networked business environment. The use of several business models simultaneously, requires availability of flexible business process models. Flexibility of business process models, in turn, depends on appropriate information systems support. One of the ways how to support business process flexibility is to use a fractal paradigm in information systems development. The fractal paradigm can be applied at two levels of abstraction: the level of business process system and the level of software system. Applications of the fractal paradigm at two abstraction levels correspond to two different opportunities of supporting flexible business processes. http://www.springerlink.com/content/w243j788g20765w6/

In “Enterprise modeling of a project-oriented fractal company for SMEs networking,” Canavesioa and Martineza write, “To address competitive threats and concentrate in their core competences and strengths, networking is the alternative of choice for survival and prosperity of most small and medium enterprises (SMEs) all over the world. For networking advantages to be fully grasped, an enterprise model describing the main organizational structure and relationships, information flows, management roles, actor behavior and constraints in the network is required. This work presents a conceptual model for SMEs networking based on the fractal company approach and concepts like projects, resources, goals, specialized actors, plans, and relationships thereof. The fractal company idea is a conceptual enterprise design that seeks to achieve a high degree of
flexibility to react and adapt quickly to environmental changes using decentralized and autonomous organizational units known as fractals.” [http://tinyurl.com/2exgu9v]

In “Best practices oriented business process operation and design,” Stecjuka, Makna and Kirikova write, “Business process flexibility has become one of the most important factors in organizational operation and development. One of the approaches to achieve the flexibility of the business process is bottom-up business process best practices propagation and leveraging of those practices at higher organizational levels by appropriate information systems design. The approach is applicable for fractal enterprises where branches of fractals are free to develop their own processes and supporting systems. The paper discussed two stages in the multilayer business process development life cycle in fractal terms. This approach permits bottom-up business process best practices propagation, leveraging those practices at higher organizational levels by appropriate information systems design. The approach is applicable for fractal enterprises where branches of fractals are free to develop their own processes and supporting systems.” The bottom-up approach allows one fractal (let’s say a department or business partner) to leverage best practices from other fractals in response to business intelligence metrics showing another fractal’s more-optimized performance. Such best practices can be propagated throughout the entire business ecosystem and each fractal is free to customize its own processes. [http://ftp.informatik.rwth-aachen.de/Publications/CEUR-WS/Vol-335/paper14.pdf]

Dr Antonie van Rensburg, in his paper Enabling Business Process Outsourcing with Business Fractals, writes: “Decision-makers are always seeking new ways to support the decision-making process at an acceptable level of risk – especially in business process outsourcing initiatives. Normally the level of risk in business processes can only be determined by understanding and studying the behavior of the business process, either from historical observation or from simulated experiments.

It has been found that traditional routes for completing process specifications based on deterministic models, or even stochastic models, may not always cover all the inherent risks that a BPO initiative entails. Through a business fractal, the analyst tries to develop more realistic models to understand the dimensions of the business process through the characteristics of memory, volatility and patterns. As such the practical application and implication of a business fractal is to provide a real-world model for decision support in defining, developing, and implementing the BPO initiative. This in turn proves to be a valuable tool in the risk management toolkit of all BPO stakeholders.

However, this process is difficult to achieve in practice, due to the number of key capabilities required to understand, scope, and manage the business process. The use of a business fractal to enable a business process initiative is a new discipline, as well as a paradigm shift. The value of this approach is to provide the decision-maker with a toolkit that approaches the problem of understanding the business process to be outsourced in a realistic manner, so that risk is transparent to all stakeholders.” [http://tinyurl.com/2w3rgm8]

Strauss and Hummel, in their paper “The new industrial engineering revisited-information technology, business process re-engineering, and lean management in
the self-organizing ‘fractal company,’” write “Recently many organizational concepts acquired currency while concentrating more on organizational, technological, or personnel aspects. A new organizational concept, based on the 'fractal company' as introduced by Warnecke, now paves the way for a simultaneous and adequate integration of the various aspects and concepts. The 'fractal' organizational approach shows that cooperative behavior and new organizational approaches concentrating on principles of self-organization may be at the root of success stories in management and organization strategy. This paper presents the theoretical conceptualization and develops some of the elements for the practical realization of a self-organizing 'fractal company' while also including a case study and some critical conclusions.”

In “The Fractal Management of SOA-Based Services Integration,” authors Zhao, Wu and Shu from Economic Manage. Sch., Beijing Univ. of Posts & Telecommun., Beijing, write “This study applies fractal theory into the system integration of service enterprise, and proposes the concept named SOA-based service integration. Through analyzing the fractal characteristics of service integration, this article proves the applicability of fractal theory to the service integration based on three main reasons. Through the establishment of the layered model of service integration structure, we propose several key points during the implementation of service integration to utilize fractal theory. In this article, we talk about three aspects to achieve fractal management of SOA-based service integration. With the principle of similarity, service-integrated enterprises should construct layered fractal units to adapt to overall objective and environmental changes. After the fractal units constructed, they can try to gain dynamic adaptive capability to adapt to mutable environment via intercommunion and elicitation, collaboration, and reconfiguration of fractal cells, so that the service enterprises can respond to future in definition rapidly and make changes immediately.”

In “Improving the New Product Development Process: A Fractal Paradigm for High-Technology Products,” Spivey, Munson and Wolcott help bring some order to the study and the practice of NPD management and introduce a new metaphor, or paradigm, for product development: a fractal paradigm. Like some fractal images, their framework for understanding the essence of NPD rests on the concept of self-similarity. In other words, the picture their framework provides for understanding and managing the NPD process consists of the same set of concerns, regardless of the level at which the process is viewed. They developed this fractal paradigm during an empirical study of technology transition in a highly successful federal laboratory organization. Whether the focus is on the organization, the division, the team, or the individual, the essence of the NPD process as viewed through their framework comes down to two sets of factors: management factors and resource factors. In turn, each of these factors cascades into several interrelated sets of concerns. For example, the management factors comprise concerns about leadership and the management system. The resource factors include concerns about information, infrastructure, time, and money. Regardless of the level of detail at which the framework is viewed, improving the NPD process requires attention to all of these factors, by all levels within the organization. For example, visionary leadership on the part of senior management will have little effect if
middle management and line supervisors fail to provide the necessary leadership for their respective groups of subordinates. Notwithstanding the complexity of the NPD process, the fractal paradigm focuses attention on those few key factors that must be managed continually, throughout all levels of the organization, to ensure successful commercialization of new products.


In “Decision Making and the Fractal Funnel,” Charles S. Brunner, NPDP Senior Consultant, Product Genesis explains how decisions made throughout the new product development process (business strategy to product implementation and launch) determine the potential for success. In today’s hyper-competitive environment, it is not enough for decisions to be made on an ad hoc or “it’s always been done that way” basis. To achieve a high success rate for products brought to market, decision making at all levels of a company need to be based on proper evaluation of available information.

Decision-making methods/tools for use in the implementation phase of new product development are well documented and applied with a great deal of frequency. During the implementation phase of product development, a great deal of rigor is typically applied in selecting and verifying design decisions. It is misguided to believe that less rigor should be required when making decisions that affect corporate direction, market opportunity selection, technology and product portfolios, and product concept selection.

He concludes that the product development process from identification of business strategy to engineering implementation and market launch is a continuous narrowing of options to a selected approach. Each narrowing process can be visualized as a funnel and as each funnel is looked at under greater magnification the underlying decision (funnels) can be seen. As with any part of business the proper tool must be applied at the appropriate time, place, and with an appropriate level of detail. The complexity of the tool must also be appropriate, not only to the problem at hand, but with the skill of the user. With this being said, even the adaptation of a simple Pugh chart to a business or market challenge can lead to new insight. By applying rigor and tools throughout the process each of the decision funnels can be traversed in a manner that identifies the drivers and interactions and provides a level of decision traceability that can be revisited as market, technical, or other applicable forces change. By applying the same requirements for detailed criteria based selection and verification of product implementation decisions to the front end of the product development process, a solid foundation for successful innovation is established.

http://tinyurl.com/2cv7eby

**LeaderValues Ltd** is a UK company. In the slide show Fractals - Zoom In, Zoom Out, a whimsical exploration of fractals, attractors & complexity issues to drive innovation and Leadership are presented. Another presentation given in Bhutan in May 2000, is regarding the Save the Children (US) Asia Leadership Team.

http://www.leader-values.com/Content/detail.asp?ContentDetailID=808

**Ann Badillo**, a seasoned business strategist and facilitator with corporate clients over the last 20 years, writes in her blog “Fractals,” about how it is useful for businesses and non-profit organizations to use the Fractal metaphor to improve business. When the
Fractal nature of that organization is deeply understood and comprehended by a consultant, that consultant has the capacity to give feedback to the leaders of that organization so that optimal flow can occur for that organization. By harnessing that flow, the organization is best able to fulfill it's deepest mission or purpose. The best and most skillful managers understand the Fractal-like "roots" of each departments, can predict their direction and current trajectory, and thus be better able to understand the structure of the other departments and empower all of them to move in a common and realistic direction toward that which is consistent with the goals of that organization. 


Nick Trendov who is the Managing Director of Scenario2 explains in his blog “Fractal Business Models and Analytics,” how Apple and Cisco compete by aligning energy and value created in their value chains with innovation on-ramps and controlled entry points to encourage and reward partners that add value. This approach is fractal in that it mimics the way the firms innovate internally and scales externally across entire value chains or value streams. This is a short explanation of fractals as applied to topography and weather though the simple patterns and perspectives are easily applied to business models and business analytics.

One of the natural limits to business model innovation is the ability to provide value across an entire value stream to buyers, sellers and other market participants. This imperative is especially acute for companies that mimic the Apple and Cisco business models by competing with their entire value chain as it is a fractal approach. While there is tremendous upside with the Apple and Cisco business models, there is also significant downside potential unless value can be quickly distributed to all value stream partners. Innovative creation and speedy distribution of value is a new way of doing business. We call it the fractal imperative.

Successful innovation requires the ability to measure and respond to markets which perform the critical function of distributing ideas and physical products. Companies that understand their markets have a tangible opportunity to employ fractal analytics to identify opportunities faster, innovate and align their business models accordingly. Fractal analytics is a way to measure from multiple simultaneous perspectives to help identify opportunities to adjust business models, objectives, products or how customers are served.


The Chinese website for free download papers, hi138.com, has an article on “On the fractal theory of the firm within the enterprise application market research,” which discusses Fractal business ideas and internal market-oriented ideas. Fractal enterprises not only emphasize the internal self-similarity and self-organization, but also stress the dynamic nature of communication with the external environment; the internal market only emphasizes the internal factors of production arrangements and operational process optimization to improve the people's initiative. Fractal enterprise has to adapt to environmental changes of the dynamic structure, each sub-shape units can design their own space, and through exchanges with the environment redefine the space and continuous improvement of internal processes, so that when the environment has changed dramatically or becomes unpredictable, the system structure can be quickly reconfigured.
to adapt to environmental change. Fractal enterprises can therefore, quickly respond to the external environment; Whereas, the internal market is not in communication with the external environment, so the internal market as an enterprise management system needs further refinement. The fractal theory of the firm as a management philosophy in Europe derives from both the connotation of the Japanese lean production management, which is the mode of production in Japan based on the analysis, and the status quo in Europe. Therefore, the fractal theory of the firm has different boundaries, different enterprise management philosophies of human co-sanctioned ideas. In the Chinese companies moving into the world there is an urgent need to establish a suitable management philosophy, by learning from and referring to the management about the common human thinking that is necessary and feasible. http://eng.hi138.com/?i46760

In the NASSCOM blog, Santanu Paul, Senior Vice President for global delivery operations at Virtusa Corporation writes in “Fractals as Complementary Hubs,” that forecasts suggest that India will export well over $60 billion worth of IT-related services annually by 2010. Comforting as that thought is, there are real challenges that can undermine such rosy projections. Many now believe that to preserve India's leadership status in outsourced IT services, what is urgently needed is a healthy dose of paranoia that will force companies out of their current comfort zones and lead to a much-needed evolution in their business models.

One clear way for Indian IT firms to distinguish themselves is to build global Centers of Excellence (CoE) for their customers. Instead of focusing only on offshoring mundane IT operations, a global CoE must become a “fractal” organization that mirrors key aspects and capabilities of the customer's IT innovation and operations, including high-end strategic ones. The benefits of a fractal CoE are manifold. For the customer, it is a strategic asset, a complementary hub to drive key competitive initiatives that cannot otherwise be accomplished within its own organization (not even with a captive offshore center, as recent Forrester research shows). To start with, as competition for talent intensifies, the customer can obtain unprecedented access to skilled resources in engineering, management and domain from an entirely different geography. Second, the complementary hub can operate at a very reasonable cost, relative to global standards. Third, the hub can become a launch pad for innovation and new revenue streams, creating products and services at an attractive price point for emerging markets such as Asia Pacific, Middle East, Africa and Latin America. http://www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=52529

H&D, which calls itself The Fractal Company on its website, says that it is the IT service company of the new generation and is fit for competition due to fractal business organization. It says on its website that Fractals are the answer to the 3rd (digital) industrial revolution.

Fractals enhance the importance of the team work approach and attach importance to the team-work approach. Each fractal is as a “company within a company” similar to the company as the whole and therefore it has to meet certain criteria. The idea of a fractal organization is to profit from existing knowhow and experience as a basis for a long term strategy.
In conclusion, they say that the transition to a versatile and development-oriented company is the central aspect of fractal organization. Change management competence and continuing knowledge building are prerequisites and enable fast adjustment processes as well as proactive and continuous advancement. Having a continuously updated overview of complex systems and fractal organizations is essential for succeeding in the modern IT services sector. Their new approaches to business processes today might be the formula for success tomorrow. And that H&D - as a new generation system house with fractal structures - is well prepared for the future

In the journal “Advances in Applied Business Strategy” authors Black, Fabian and Hinrichs write about “Fractals, Stories and the Development of Coherence in Strategic Logic.” In this paper they “look at how understanding the basic rules governing the iterative mathematical generation of fractals might be translated into understanding a mathematics of social systems.” In particular, they “apply the fractal metaphor to illustrate the creation of a coherent strategic orientation in a nonprofit organization and believe that the use of 'stories' in prominent organizational publications is an integral part of the generation of a coherent strategic orientation.”
http://www.emeraldinsight.com/books.htm?chapterid=1760314&show=abstract

In the paper 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem, authors Carayannis and Campbell write that “‘Mode 3’ allows and emphasizes the co-existence and co-evolution of different knowledge and innovation paradigms: the competitiveness and superiority of a knowledge system is highly determined by its adaptive capacity to combine and integrate different knowledge and innovation modes via co-evolution, co-specialization and co-opetition knowledge stock and flow dynamics. The 'Quadruple Helix' emphasizes the importance of also integrating the perspective of the media-based and culture-based public. What results is an emerging fractal knowledge and innovation ecosystem, well-configured for the knowledge economy and society.”

Ruth Malan and Dana Bredemeyer, in their Executive Report on “The Art of Change: Fractal and Emergent,” cover the following aspects:
i) a model of change, showing how the vectors of change are different at different points in the lifecycle, so that agility means different things, depending on where in the lifecycle the product-market is
ii) a discussion of how the meaning of business and the meaning of design are shifting
iii) Jeff Bezos notion of fractal strategy, leveraging it to illustrate how fractal strategy enables intrinsic agility
iv) positioning IT as a leading player on a strategic stage where relationships and business intelligence are key drivers of innovation and agility
v) the tandem role of strategy and architecture in an agile business and the implications for architects
vi) a fractal notion of leadership, in a business that relies on fractal strategy and tandem architecture to combine intentional goal-seeking with emergent responsiveness
Michael Pearson writes in his paper titled “Fractals, Complexity and Chaos in Supply Chain Networks” that “Recent work identifying an equilibrium solution in a supply chain network through cooperation and coordination along edges (links) in the network identifies the links as the stochastic modeling entities rather than the nodes of the network. This has been generalized to a supply chain network where the equilibrium solution applies to interactions between components of supply chain networks. We introduce the concept of a component decision-maker in a supply chain as a fractal. With the aid of a simple transformation we outline features of self-similarity, invariance, chaos and feedback mechanisms, and examine some repeating patterns in prediction capability control charts. We also discuss fractal geometry in the evolution of supply chain networks.”

Authors Ryu, Son and Jung write in their paper “Framework for fractal-based supply chain management of e-Biz companies,” that “The high degree of uncertainty of customer demand makes it difficult for e-Biz companies to facilitate their profit maximization. The type of e-Biz company focused in this paper is a B2C (business-to-customer) which connects customers with product manufacturers through the Web interface. In this paper, the B2C company interacts with customers, multiple external manufacturers and a single transportation system. To deal with complicated interactions and relationships among customers, manufacturers and a transportation system, a comprehensive management system to support the B2C company is inevitable. This paper proposes a fractal-based framework for the management of e-Biz companies, where each member in the supply chain is modeled with a self-similar structure referred to as a 'fractal'. The basic fractal unit (BFU) consists of five functional modules, including an observer, an analyzer, a resolver, an organizer and a reporter. In this paper, functions of each module will be defined with UML (Unified Modeling Language). Then, the analyzers and the resolvers (modules associated with decision-making) for each individual fractal will be specified with mathematical models. A profit model for the company-level fractal will then be formulated. Finally, a numerical example for an exemplary e-Biz company functioning B2C will be presented for the illustration of the proposed methodology.”

Sun and Ye in their paper titled “Research on Entropy Model of Order Degree of Fractal Supply Chain Network,” write that “According to the relation between generalized fractal dimension and generalized entropy, obtain entropy through fractal dimension, and expand and improve the system structure entropy model, furthermore, establish entropy model of order degree of FSCN system based on organizational structure entropy and information entropy. Meanwhile, reveal generation and propagation of information accord with fractal growth in DLA model to get information fractal dimension and information entropy. And an example is provided to explain and compare the result. Moreover, entropy mechanism of FSCN system mutation is deduced from
Focusing largely on the thriving Small & Medium Enterprises, **Hash Solutions** has developed a suite of enterprise-level management applications named Fractals. Fractals consists of a single suite of related technologies that serve any and all management needs of Small and Medium Enterprises. From Customer Relationship Management (CRM) to Inventory Management to Accounting to Document Tracking and Internal Communication, Fractals cover every possible permutation and combination of Managerial applications to manage businesses with a holistic view! The entire suite is broken up into modules and each module in turn is broken up into features. Hash Solutions gives complete freedom to choose exactly those modules and features that are required and those will be customized. Fractals to suite one's unique and specific needs. The Supply Chain Management solutions span all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

Wirtsch, Sihn and Klink in their paper titled “**Fractal Businesses in an E-Business World**,” write “The modern corporate management is still in a state of permanent change, whose dynamics of development is rather increasing than decreasing. This change takes place especially in a linking up of value added activities (that occurs more and more in a cross-company way) and the computerization of business processes. It occurs under various approaches and keywords (e- business, supply chain management, virtual business, e-procurement,..). This change on the one hand includes a successive adjustment to known trends, and on the other hand it includes new challenges for corporate management. In this paper, the change in corporate management is discussed using the concept of the ‘fractal business’ as an example. Solutions for the future are sketched, too.”

Authors Dong, Zeng, Wang and Lu in their paper titled “**Price Forecasting of Supply Chain Product Based on Dynamic Fractal Dimension**,” discuss how Supply chain management (SCM) is an emerging field that has commanded attention and support from the industrial community. Demand forecast taking inventory into consideration is an important issue in SCM. This paper presents a novel computerized system for implementing the forecasting activities required in SCM. It can help the supply chain enterprises find hidden forms, trends and relationships in the date of supply chain by the dynamic fractal dimension of fractal theory, find that dynamic fractal dimension not only can overcome the delay of the existing technical analysis on the price forecasts, and but also can instruct the supply chain product prices in advance. http://tinyurl.com/2wxye5o

In the article “**Building enterprise-wide information supply chains based on the fractal concept**” authors Walsh, Koutsakas, Vontas and Koumpis present their work carried out in the wider context of the IST Adrenalin project whose aim is to facilitate formation and lifecycle management of networked enterprises utilizing concepts from...
two key information research areas. The approach described places heavy emphasis on
the notion of mobile agent technologies and their adaptation for achieving the IT
realization of the above theoretical background. It covers specification, design and
conceptual realization of how information supply chains and routes can be organized and
navigated across networked enterprise activities within the context of a branch
independent model. Builds on the distribute and integrate concept as well as on the fractal
idea by supporting self-similarity, self-organization, self-optimization and dynamic
organizational behavior. The harmonized combination of the concepts formulated in the
Adrenalin theoretical framework and their IT realization are employed within the context
of a real-world case study in an industrial ERP system.
http://www.emeraldinsight.com/journals.htm?articleid=850990&show=html&

Authors Oh, Cha and Jung, in their paper “Fractal Goal Model for the Fractal-Based
SCM,” presented at the 7th Asia Pacific Industrial Engineering and Management
Systems Conference 2006, 17-20 December 2006, Bangkok, Thailand, discuss about the
well known fact that customer’ needs have much influence on the structure of supply
chains. Uncertainty in customer demands forces companies’ supply chains to be very
flexible. When a company can not meet customers’ changing needs, competitiveness in
market places will be jeopardized. To survive in the competitive market places, structure
of supply chains should be reconfigurable. In this paper, fractal concept is adopted to
handle the reconfigurable issue. In a fractal-based SCM, structure of supply chains can be
automatically reconfigured through the dynamic restructuring process with a fractal goal
model. Goal in the system is divided into sub-goals, which are represented by a fractal
goal model. The fractal goal model is a formal model which can be evaluated, changed,
and scaled easily. Thus, a well-designed fractal goal model is indispensable for a fractal-
based SCM, and enhances the reconfigurability. In specific, fractal structure for
reconfigurable SCM is designed and presented. The fractal goal model is applied to SCM
to evaluate EOQ between a manufacturer and suppliers. Reconfiguration procedure is
also explained using an exemplary scenario. http://tinyurl.com/3afa74t

Surana, Kumara, Greaves and NandiniRaghavan in their paper titled “Supply-chain
networks: a complex adaptive systems perspective,” discuss that in this era,
information technology is revolutionizing almost every domain of technology and
society, whereas the 'complexity revolution' is occurring in science at a silent pace. In this
paper, they look at the impact of the two, in the context of supply-chain networks. With
the advent of information technology, supply chains have acquired a complexity almost
equivalent to that of biological systems. However, one of the major challenges that we
are facing in supply-chain management is the deployment of coordination strategies that
lead to adaptive, flexible and coherent collective behavior in supply chains. The main
hurdle has been the lack of the principles that govern how supply chains with complex
organizational structure and function arise and develop, and what organizations and
functionality are attainable, given specific kinds of lower-level constituent entities. The
study of Complex Adaptive Systems (CAS), has been a research effort attempting to find
common characteristics and/or formal distinctions among complex systems arising in
diverse domains (like biology, social systems, ecology and technology) that might lead to
a better understanding of how complexity occurs, whether it follows any general
scientific laws of nature, and how it might be related to simplicity. In this paper, they argue that supply chains should be treated as a CAS. With this recognition, they propose how various concepts, tools and techniques used in the study of CAS can be exploited to characterize and model supply-chain networks. These tools and techniques are based on the fields of nonlinear dynamics, statistical physics and information theory. 
http://www.informaworld.com/smpp/content~db=all~content=a723970704

Agent-oriented BPM ...

In “Integrating Mobile Agent Infrastructures in Operational ERP Systems,” by Vontas, et al, present their most recent work carried out in the wider context of the IST-ADRENALIN project, to facilitate formation and lifecycle management of networked enterprises. The projects focus is on designing and building an execution ‘kernel’ for mobile agent applications, using the Aglets platform and integrating it with any existing ERP system. For integrating mobile agent infrastructures in operational ERP systems, they developed a generic model, a Mobile Agent Model. This model is branch independent and builds on the Adrenalin Company concept, where the fractal and the Information supply chain concepts are combined, introducing that every process, activity and resource can be defined with the ‘triangle’ of executor – controller - coordinator tasks, supporting characteristics of self-similarity, self-organization, self-optimization and dynamic organizational behavior. http://delab.csd.auth.gr/papers/ICEIS02vkakhmv.pdf

In “Managing Information Supply Chains,” Walsh and Koumpis describe how Europe's ADRENALIN Project takes a shot at improving highly networked enterprise systems. The ADRENALIN project has made a start at defining important architectural principles for Information Supply Chains within next generation enterprises. Fractal Company concepts have been introduced as a key enabler for moving from function orientation in enterprises towards the more powerful approach of process orientation. Traditional architectural efforts require a substantial initial investment in time and money. First, the current baseline must be captured, and then a target architecture must be developed. Only after these efforts are completed is it possible to implement the relevant architecture changes. Yet, today, many initiatives are underway for implementing new enterprise IT architectures. These initiatives, both at European and international levels, are important for supporting existing as well as emerging business needs that cannot be stalled pending the development of current and targeted enterprise IT architectures. http://www.acm.org/ubiquity/views/p_walsh_1.html

In “Implementing information supply chains: the IST Adrenalin project” authors Koutsakas, Hatzaras, Vontas and Koumpis present their most recent work carried out in the wider context of IST-Adrenalin project, dealing with the facilitation, formation and lifecycle management of networked enterprises and organizations. In this respect, how information supply chains and routes can be organized and navigated across networked enterprise activities is specified, designed and realized in a conceptual way within the context of a branch independent model that builds on the fractal idea by supporting self-similarity, self-organization, self-optimization and dynamic organizational behavior. The approach described places heavy emphasis on the need for interoperable, integrated, and
cost-effective business practices and capabilities within each individual organization and across the supply as well as the value chains with respect to information technology. A reflection of the above approach will be realized by the efficient optimization of the information supply chain and fractal company concepts which will in turn significantly affect the design and performance of the industry concerned (and particularly networked organizations).

http://www.emeraldinsight.com/journals.htm?articleid=852202&show=html

In “Autonomous Agents for Business Process Management,” N. R. Jennings et al. write, “The design and implementation of corporate-wide business management systems is a complex activity. The software has to support the distributed design and operation of many concurrent activities that are highly interdependent. Moreover, many of the activities have a real-time component, require the ability to access legacy software, and need context-dependent execution (i.e. their operation depends on the state of previous activities and of the environment—they are reactive systems). In short, business management is a demanding domain that requires state-of-the-art software solutions. In this work, it was decided to conceptualize, design, and implement the business process management system using an agent-based approach. Thus in project ADEPT (Advanced Decision Environment for Process Tasks) the business process is viewed as a collection of autonomous problem solving entities that negotiate with one another and come to mutually acceptable agreements that coordinate their interdependent sub-activities. The main advantages of this approach over more traditional counterparts such as management information systems, workflow management, and enterprise integration are that it offers greater flexibility, agility, and adaptability.”


In “A Business Process Management System Based on Mobile Agent Technology,” J.Y. Kuo calls for going beyond ADEPT’s stationary agents and on to Mobil Agents.

http://dspace.lib.fcu.edu.tw/dspace/bitstream/2377/2250/1/ce07ics002002000334.PDF

In “Agents of change in business process management,” O’Brien and Wiegand describe how agent-based process management systems can provide powerful tools for managing the enterprise of the future. The paper explores recent work combining distributed computing technology with autonomous software agent techniques for business process management, and argues that these represent a viable supplement and even an alternative to existing workflow management systems. This is supported by the results of a number of projects, including ADEPT, BeaT and a number of other related schemes, which are exploring how leading edge technology can improve the way business processes are managed. This paper provides a vision of how agent-based process management systems can support the needs of the virtual enterprise of the future and the integration of the information systems of small to medium-sized enterprises (SMEs) to form Virtual Enterprise Networks (see Thompson: http://www.mkpress.com/TNE).

http://www.springerlink.com/content/n24360061587m3q8/

Unland, Kirn, Wanka, O’Hare and Abbas write in their paper “AEGIS: Agent Oriented Organizations,” that “Today’s enterprises are challenged by a rapidly increasing demand
for flexibility within their internal structures. They need to be able to respond rapidly by customizing their internal processes in order to be able to introduce competitive products into the market place. These requirements have already stimulated huge research efforts in organizational theory, whilst information technology research on how to support customization of computer-based business processes has not yet been adequately investigated. This paper has addressed the question of how coordination in decentralized, process-oriented organizations can effectively be supported by modern information technology. More specifically, it addresses the issue of cooperative organizational problem solving within such settings in that it suggests to base system design on the concept of multi-agent planning.

The approach presented in this paper allows us to apply a recognized Distributed Artificial Intelligence technique called multi-agent planning as a tool to achieve, at least partially, automated business process (re-) engineering and, via an appropriate design of local and global aims, to proceed towards automatic process customization. To model and modify multi-agent plans two sets of interaction types (interactions among process models, interactions among a process model with its environment) and two sets of modeling operations (modifications, abstractions), which can be performed on process models, were introduced. The validity of this approach was demonstrated by a credit application example which shows how a multi-agent system can create a multi-agent plan through plan refinement. The contribution of this paper is threefold:

- It introduces the concept of **agent oriented organisations** and it illustrates how such an approach could be used within the context of a banking application.
- It introduces the technical concepts by which this approach can be translated into specifications and implementations of the respective information system architectures.
- It synthesizes business process orientation and multi-agent planning, and thus demonstrates the applicability of Distributed Artificial Intelligence techniques to business applications.

http://tinyurl.com/23up3c3