

**FROM ENTERPRISE NETWORK TO NETWORK ENTERPRISE:  
ANOTHER PERSPECTIVE OF MULTIPLE CRITERIA DECISION MAKING FOR BUILDING  
CORPORATE INFORMATION SYSTEM**

JONGWON LEE

Corporate Information Systems Laboratory  
Korea Advanced Institute of Science and Technology  
Seoul, 207-43, South Korea  
E-mail: jweel@msd.kaist.ac.kr

MYUNG HO SOHN

Corporate Information Systems Laboratory  
Korea Advanced Institute of Science and Technology  
Seoul, 207-43, South Korea  
E-mail: totalsol@kgsms.kaist.ac.kr

HEESEOK LEE

Corporate Information Systems Laboratory  
Korea Advanced Institute of Science and Technology  
Seoul, 207-43, South Korea  
E-mail:hsl@kgsms.kaist.ac.kr

YONG SHI

College of Information Technology, University of Nebraska  
Omaha, Nebraska, USA

**ABSTRACT**

Enterprise network is an important component for building corporate information system. Furthermore, dramatic changes of computing and communication technologies make it possible for enterprise network to run the whole business process. This paper proposes a new perspective of enterprise network, called network enterprise. Network enterprise can maximize the potential of the network resources. A multiple criteria decision making framework is employed to illustrate the practical usefulness of this perspective. Furthermore, a methodology, PAM (Potential Analysis Methodology), is proposed to enable the network enterprise.

**KEYWORD**

Network enterprise, Enterprise network, Business model, Business potential, Networks development methodology.

**1. Introduction**

**1.1 Definition of enterprise network**

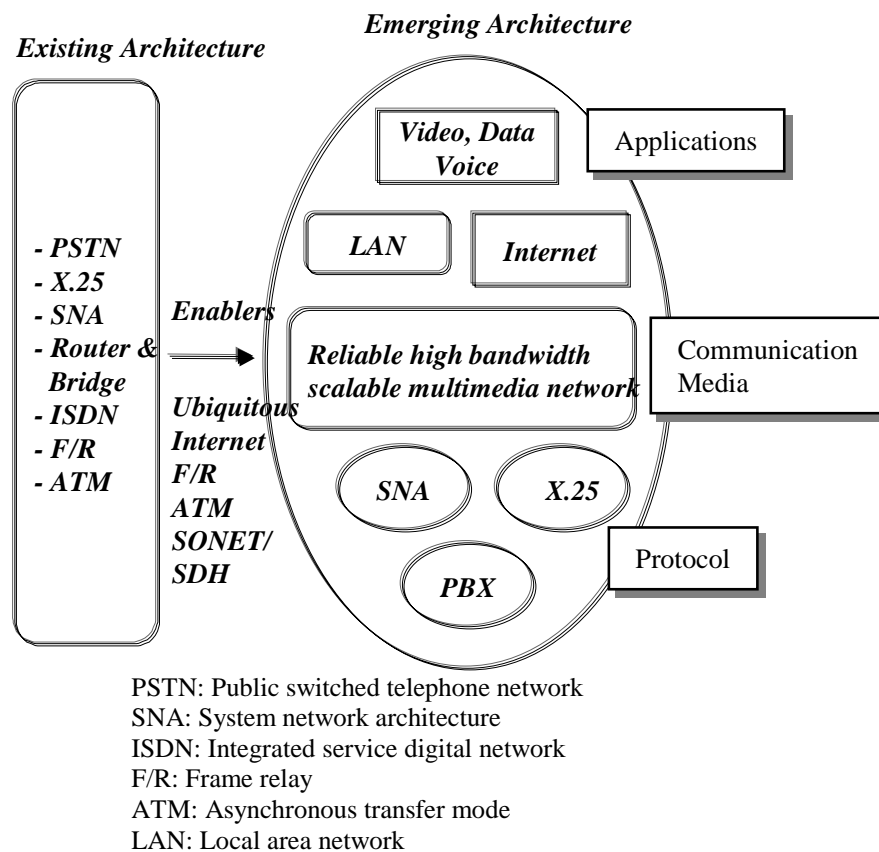
An enterprise network is one of the most important additions to corporate environments. It meets ever increasing needs for dispersed business operations. Furthermore, It has become a radical force of change in the corporate environment. The massive deployment of corporate networks can transform the corporation in several ways; they can provide competitive advantages by the use of innovative method of marketing and customer services and thus allow restructuring and downsizing with vertical disintegration. The interest in such a distributed configuration has become increasingly important, partly because of technological advances in data communication coupled with major distributed information processing needs. A corporate network sharpens internal corporate communication, such as electronic mail (E-mail), computer conference systems (CCSs), electronic information services, and groupware. Furthermore, it may be connected with external networks.

The popularity of these networks in today's enterprise information processing services makes their management increasingly important. The enterprise, large or small, has made significant investments in its networking services, and organizations are likely to continue to invest in these networks. Evolution of communication and computing paradigm

Enterprise networks have faced a new era because of the revolutionary change of technologies for computing and communications. Driving forces behind the realization of next-generation enterprise network include (i) openness of the computing environment, (ii) expectation of more features, (iii) killer technologies[4] rather than applications and (iv) proliferation of new paradigms rather than fine-tuning, automation, or consolidation. The driving forces stem from a mixture of novel technologies and market-customer evolution. The business model changes drastically; after years of wisdom saying “customer is at the center and leads the market”, we are now on the brink of making it happen. From "product push" (already an evolution from "technology push" of 1980s), "product pull" arrives; customers customize their own products. In order to make this new paradigm a reality, enterprises need to change and open their processes for both providers and clients.

Traditionally, an enterprise network adopts wide-area private network technologies. However, technological advancements force corporate network engineers and decision-makers to use a variety of open technologies[1, 3, 7]. These technologies provide system independence[4]; (i) operation system independence; openware technologies such as Hypertext Transport Protocol(HTTP), XML, HTML, Java script, or ActiveX (ii) transmission protocol independence, i.e., the need to deliver services using asynchronous transfer mode(ATM) or Transmission Control Protocol/Internet Protocol(TCP/IP) and (iii) application independence (e.g., universal digital personal assistant).

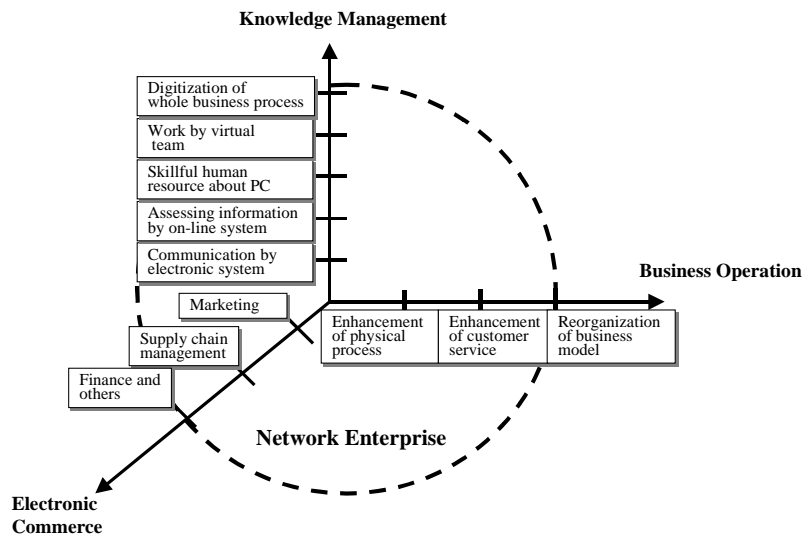
On the basis of these UFO(ubiquitous, fast, open) technologies[11], communication technology evolves to a network integrated broadband network as shown in Figure 1[2].



<Figure 1> Evolution of communication

### 1.2 A new perspective: network enterprise

Advanced computer and communication technologies affect the enterprise management significantly. Geographical expansion was one of major functions of enterprise. Enterprise network has three major aspects of corporate management: commerce, knowledge management, and business operation. These three management modes and their trends as well as network enterprise coverage are depicted in Figure 2. Three modes are explored in further details as follows.



<Figure 2> Management modes by enterprise network

Internet provides the economic entities with a platform of electronic commerce. Economic entities are suppliers, consumers, investors, bankers, and electronic tools for transactions. First, the corporate can execute marketing such as advertising, sales, and distribution. Next, supply chain management (e.g., business to business electronic commerce) emerges. Typically, the final phase is an electronic commerce in financing such as funding and loan.

Furthermore, the network can improve the way of knowledge management[9] of the enterprise. First, it can speed up communication by electronic system. Second, it facilitates the use of on-line information. Third, the workers are then more skillful of using information devices. Fourth, workers can collaborate in a virtual team. Lastly, every business process will be digitized and the results will be stored on an integrated enterprise database. The enterprise can create, store, reuse and reprocess the knowledge of management.

The third aspect affected by a corporate network is business operation. The enterprise network may enhance physical process, customer service, and then business model. The enterprise network covers these business operations.

In sum, a new paradigm of enterprise network, network enterprise, is proposed. As the communication and computer technologies advance rapidly, enterprises based on network enterprise appear.

Network enterprise is considered to be a business process itself, not a subsystem, as its effect on business and management increases drastically. Network enterprise is a futuristic form of enterprise network as indicated in Figure 2.

## 2. Comparison with past methodologies

### 2.1 Past methodologies

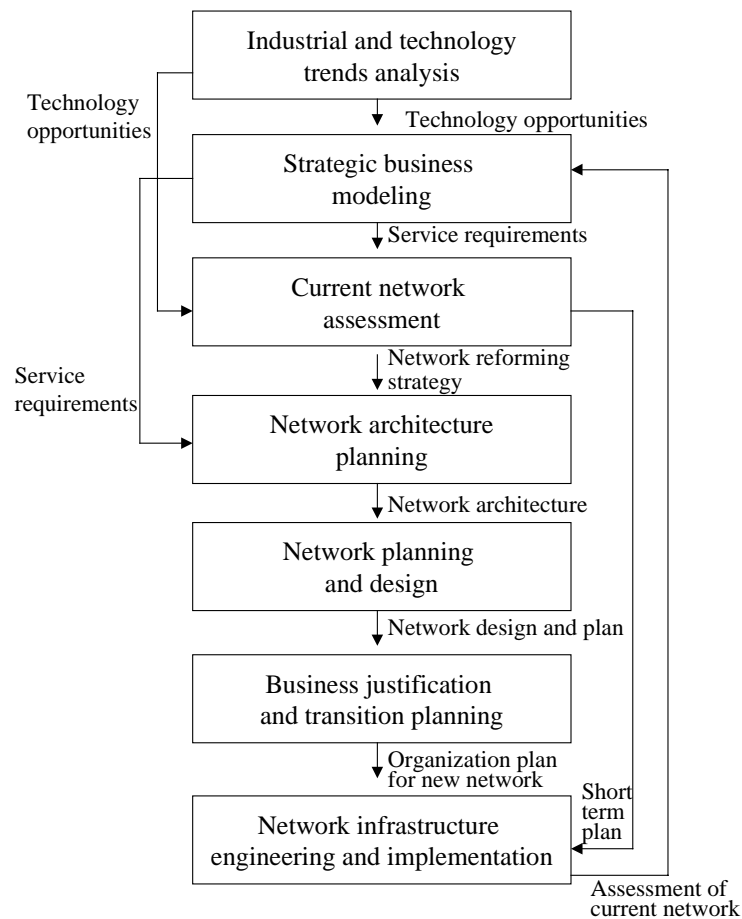
A variety of methodologies for building the network enterprise have been proposed from the perspective that the network is a part of information system. [3, 4, 6, 7, 20, 21]. Among these methodologies, Drakopoulos' strategic network planning(SNP) process[4] is very systematic and most recently investigated. Therefore, this paper uses SNP to illustrate the conventional methodologies. Typically enterprise network design begins with industry and technology trend analysis. SNP methodology consists of seven phases as illustrated in Figure 3. Each phase may be explained further as follows.

#### (1) Industry and technology trends analysis

This phase analyzes the implications of technology advancements on business processes, functions, and applications in terms of time of introduction, maturity, acceptability, and standards.

#### (2) Strategic business modeling

This phase analyzes business requirements and revenue opportunities. It identifies the business applications and services that need to be supported by the network infrastructure.



<Figure 3> Strategic network planning process

### (3) Current network assessment

This phase assesses the usage of network technology and develops an inventory of the current network infrastructure. It identifies the strengths and weaknesses of the current network infrastructure, the opportunities to enhance network potential, and barriers in the successful utilization of network solutions.

### (4) Network architecture planning

This planning phase develops network architectures in view of technology capabilities. This phase is independent of the physical network implementation. The emphasis is on developing conceptual architecture models that specify main functions that need to be performed.

### (5) Network planning and design

This phase makes short, medium, and long term network plans, according to the defined network architecture. Typically, optimization techniques are used to minimize the total network infrastructure cost while meeting all constraints and design requirements(e.g., [2, 8, 17]).

### (6) Business justification and transition planning

This phase identifies the strategies and actions to close the gap between the current and the desired state of the corporate network infrastructure. A variety of engineering economic methods and tools are employed to evaluate alternatives and provide business justification for network technology investment recommendations.

### (7) Network infrastructure engineering and implementation

This phase addresses detailed engineering and network infrastructure deployment and implementation issues. The main activities include network requirement specification, workload characterization, network topology design, network dimensioning, analysis and comparison of design options, and network design verification. The purpose of the workload characterization activity is to identify the traffic characteristics and network

resource requirements of the current and planned business applications. The network topology design activity addresses network optimization issues such as the number and location of network nodes and the connections between them, taking into account the constraints imposed by the existing network infrastructure. The network dimensioning task adopts (i) performance and reliability modeling and (ii) optimization methods to determine the network configuration on the basis of the network architecture, technology, and traffic load. Finally, the various configurations are compared and evaluated. This comparison and evaluation is iterative, and involves sensitivity analysis that allows designers to modify design parameters and select new scenarios.

## 2.2 Comparisons

Typically, conventional methodologies begin with business requirements such as business strategies and objectives with simple technological trend analysis. They attempt to meet the business objectives by efficient use of network resources. Building network enterprise requires a new paradigm. Designers must attempt to solve the network problem from a different perspective. The potential of the network is important. Most past methodologies assume that enterprise network should be only a component of corporate information system. However, the network is more likely to be a business itself in this dramatically changing business environment.

Therefore a methodology is proposed to maximize the potential utility of the network resources. This new methodology will be referred to as PAM (Potential Analysis Methodology) from the enterprise network perspective. Table 1 compares the methodologies from the new paradigm (Network Enterprise) with those from the past paradigm (Enterprise Network).

**Table 1. Comparison**

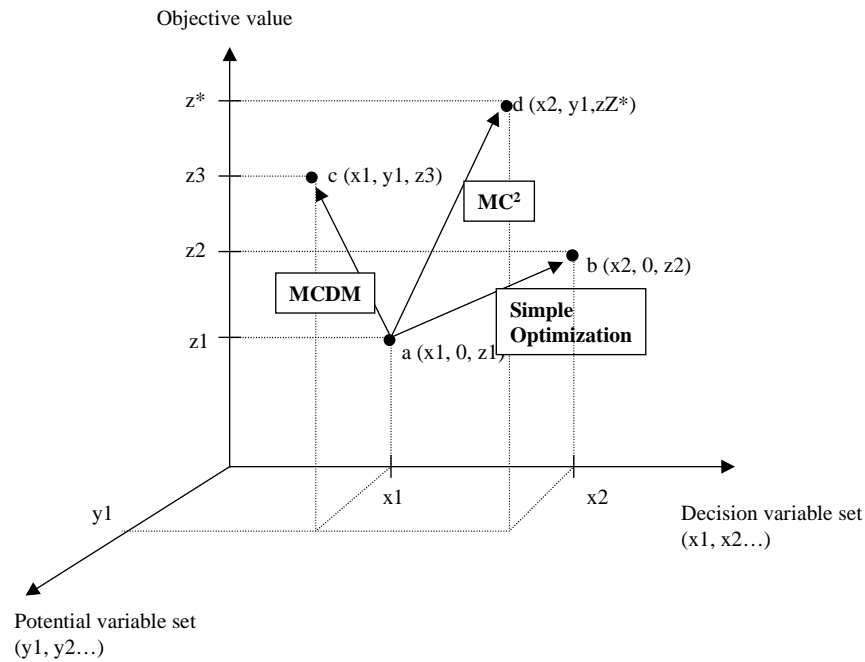
Methodology Perspective	Enterprise network	Network enterprise
Starting Point	Corporate objectives	Current network
Determinant	Business requirement	Network technology
Goal	Optimization of corporate objectives by minimal use of network resources	Maximization of the potential utilization of current network resources
Emphasis	Network alternatives and components	Network potential
Examples	Drakopoulos[1999]	Potential analysis methodology

## 2.3 An implication: from multiple criteria decision making perspective

Solutions by PAM can be illustrated from a multiple criteria decision making perspective as shown in Figure 4. Enterprise network approaches attempt to find the best design under the given technology condition. This idea is similar to a simple optimization technique (achieving “b” point as shown in Figure 4). In order to alleviate this problem, an objective value may be relaxed (achieving “c” point). A number of methods (e.g., [12, 14, 15]) can be used for changing objective values. These methods fall into the category of MCDM (Multiple Criteria Decision Making).

In contrast, the network enterprise approach finds the network solution by using potential variables as well as decision variables (“d” point can be achieved). This idea is similar to MC<sup>2</sup> (multi-criteria multi-constraint levels) optimization techniques [16, 18, 19].

However, most past methodologies adopt highly analytical tools like mathematical programs or simulation. These methodologies, however, are not flexible enough to solve the overall problem for building the network enterprise. Therefore, this paper proposes a more flexible methodology called PAM.



<Figure 4> Implication of potential analysis methodology

### 3. PAM: a methodology for building network enterprise

PAM consists of six phases: network assessment, potential analysis, strategy development, business modeling, business development, and business assessment (Figure 5). For clarity, the feedback among phases is not depicted.

#### (1) Network assessment

PAM begins with the assessment of network technology. Network designers explore network alternatives and analyze the feasibility of the network technology. They can decide on technological alternatives. If the company has possessed the enterprise network already, it may be the first technical alternative to assess. If the enterprise plans to build a new network, the the-state-of-art network may be the first alternative.

#### (2) Potential analysis

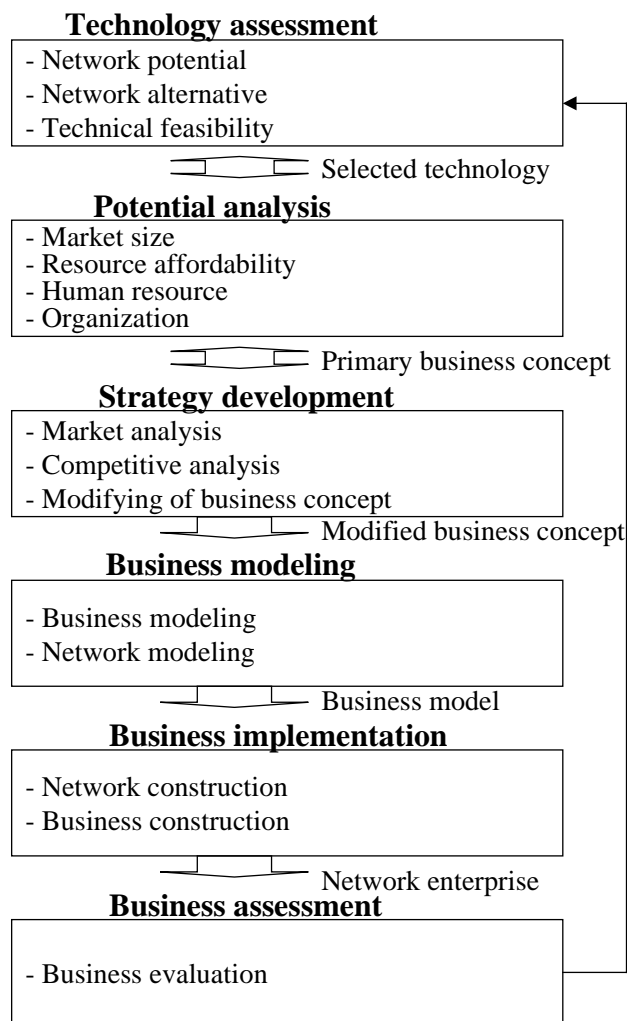
The network designers analyze the potential of the alternatives. The potential implies how the network may contribute to achieving the business objectives such as profit maximization, customer satisfaction, or cost minimization. Potential can be defined in terms of the market size, material affordability for product and service, human resource, and network organization. This phase is executed interactively with the network assessment phase. The best alternative of technology and the corresponding primary business concept may result from this interactive process.

#### (3) Strategy development

The business model is highly risky to guarantee the success without the understanding on the market. Designers analyze market situation: market growth, competitors, or strategies. The business concept can thus modified according to this market situation.

#### (4) Business modeling

A concrete business model is built according to the modified business concept. The designers make blueprints for major business processes such as marketing, personnel, finance, organization, and business operation. In addition, the corresponding network model is built.



<Figure 5> PAM phases

(5) Business implementation

A real-life business starts and the network is built. The business operates on the network.

(6) Business assessment

This final phase evaluates the business performance. The business performance has been set in the potential analysis phase. The evaluation results are used for reassessing the technology potential.

**4. Conclusions**

This paper addresses another perspective for building enterprise network, i.e., network enterprise. The emphasis of network enterprise is on defining the potential of the network in advance. In contrast, the previous studies attempted to adjust the network according to business objectives and constraints. The network enterprise perspective is more powerful when the potential of the network changes rapidly. This perspective is likely to sharpen the network and business concepts as multiple criteria decision making technology advances. Authors are in the process of enhancing the proposed network enterprise paradigm and methodology. The methodology will be applied to a real-life case to validate its practical implications in the near future.

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