Working for E-Business – The Business Engineering Approach

Robert Winter

Managing Director, Institute of Information Management
University of St. Gallen, St. Gallen, Switzerland
E-mail: Robert.Winter@unisg.ch

ABSTRACT

Driven by IT innovations and new business paradigms, the transformation of traditional business models and business architectures to electronic business is imposing huge challenges particularly for large organizations. This paper introduces business engineering, the discipline of collaborative, model-based conceptualization, design, and implementation of transformations in companies and in administration. Based on an analysis of the transformation to electronic business, business engineering is introduced with regard to its vision (business architecture and business models of the information age), its most important components, and its methods. Based on an analysis of the roles of business engineers in 'old' and 'new' companies, the career options for business engineers are analyzed, and requirements for educational institutions are derived. The paper ends with some conclusions and directions for future research.

Keywords: Electronic business, business engineering, transformation, business architecture

I. TRANSFORMATION

Companies around the world find themselves busy with adapting to transforming markets, transforming industries, and transforming business rules. These changes are triggered by

- IT innovations, i.e. by exploiting business potentials of new or enhanced information & communication technology products or solutions (Moreton/Chester 1996), and by
- new business paradigms, i.e. by applying novel forms of collaboration and coordination between companies and within companies (Österle/Fleisch/Alt 1999).

In this introduction, the phenomenon of transformation to electronic business is analyzed. Some transformation examples are introduced which then are generalized to a transformation model. The challenges of transformation for information systems research are discussed, and the outline of this paper is presented.

TRANSFORMATION EXAMPLES

Swiss Electronic Exchange SWX has replaced traditional stock exchanges in Switzerland completely. With similar phenomena in other countries (e.g. Xetra in Germany), we expect security trading to be automated and centralized throughout Europe within a short time. 'Exploiting IT innovations' means to create electronic exchanges that allow to execute traditional transactions cheaper, faster, more transparent, and independent from certain domiciles. 'Applying new business paradigms' means to utilize technical and organizational networking to disintegrate the European system of universal banks into few, very large, product-oriented banking 'factories' and a huge number of flexible, customer-oriented integrators as well as many electronic shared services. This transformation will create more discontinuities for the financial sector within the next five years than there had been during the last century.

MP3 and other formats for storing and transferring content are about to re-invent the media industries and to make some traditional business models obsolete. 'Exploiting IT innovations' means to create opportunities to order and watch / listen to the latest releases, assemble customized CDs, and integrate media that are used to be the foundation of separated

industries. 'Applying new business paradigms' means to re-design the value network into multi-media production specialists, content integrators, and electronic markets for businesses and for end consumers (e.g. Napster).

Open protocols, common access to the internet, and application-oriented standards have created huge productivity potentials for supply chains. 'Exploiting IT innovations' means to utilize electronic data interchange to automate materials management, let inventories shrink, and shorten delivery times. 'Applying new business paradigms' means that companies found many different ways to intensify cooperation with customers and suppliers. Direct forms of cooperation include common planning facilities (e.g. SAP's APO) or direct connections between their ERP systems based on inter-company business process specifications, while indirect forms of cooperation include electronic markets and open industry standards.

Many IT innovations (e.g. ATMs) are today a natural part of our lives. To introduce these innovations, however, complex transformations were necessary. In the case of ATMs, bank clerks had to be transferred to (and qualified for) new jobs, new companies and networks had to be created to operate the ATM network, national and international standards had to be agreed upon, and much more.

TRANSFORMATION MODEL

Transformation means to re-create existing companies or to create new companies. Most transformations are triggered by new or improved hardware and network components, new standards, new or improved standardized software packages, new electronic services, or new forms of information sourcing and utilization, etc. Although transformations are enabled by IT innovations, however, guidance and support is necessary by adapted or novel business models and / or business architectures. The role of IT innovations as transformation enablers is illustrated by figure 1.

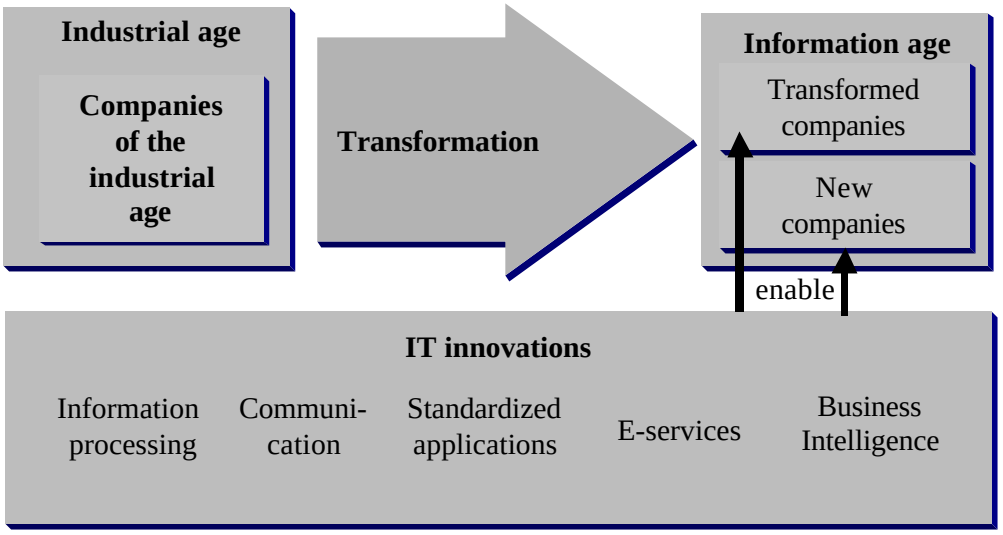


Figure 1: Transformation Model (Österle/Winter 2000)

TRANSFORMATION AS A CHALLENGE FOR INFORMATION SYSTEMS RESEARCH

From a business perspective, it is mandatory that business potentials of IT innovations are systematically assessed, that appropriate business strategies are (re-)formulated, that appropriate business processes and organizational structures are (re-)designed, and that appropriate information systems are implemented. Organizational structures may have to be decomposed and re-assembled, mergers and acquisitions may occur, business units may be sold, start-ups may have to be split off, or alliances or other forms of formal cooperation between companies may have to be created. In addition, transformation means that contracts have to be negotiated, appropriate qualifications have to provided for employees, attitudes have be changed, and political decision processes have to be modified.

The pace of transformation is increasing as innovations allow for radical changes (e.g. disintermediation by direct sales to end consumers) and regulations are vanishing. Companies split off into components which find their ideal role in different value networks. It becomes more and more imperative to assess business potentials of IT innovations rapidly and to design adequate implementations. Many aspects of the current situation resemble ‘classical’ periods of revolutionary economical shifts, e.g. early industrialization or belle époque.

Actual valuation corrections for new economy pacemaker companies lead to the question whether the transition to electronic business is a limited phenomenon or whether a sustainable economic development has been started. Transformations will occur as long as IT innovations create business potentials. Business potentials will be exploited as long as they contribute to increasing market capitalization. In 1998, the IT business market has reached 1 billiard (10^{12}) USD worldwide for the first time (CRA 1999) and kept growing with an annual rate of about 10%. If only 5% of the sales are spent for research and development, annual investments of more than 50 billion USD are made. Risk capital and IPOs will create even higher investments in research and development. From a business management perspective, such huge investments should create sufficient IT innovations to fuel business transformations for many years to come. Since new technologies often need 10 to 20 years until being ready for the market, many of these innovations are already in the pipeline. As a consequence, we expect another 20-30 years of IT-enabled innovations to change to shape of our economy, maybe even at a higher pace and affecting even more people.

From the following IT innovations, significant transformations can be expected soon:

- Cheap, broadband communication networks, both for mobile and fixed line communication
- Digital convergence of traditional media (books / magazines, music, photography, movies, information services)
- Connected smart appliances
- Emergence of standards that allow for flexible networking between individuals, organizations, and digital devices / appliances
- Continuing growth of microprocessor performance at decreasing costs
- Maturity of standardized software packages for business networking
- Availability of applications for enterprise integration, information logistics, and knowledge management

Even more important than the business potential of an isolated IT innovation is the business potential of integrated technologies or applications. E.g., the combination of connected smart appliances like UMTS phones with standardized applications for electronic transactions allow for completely new business models in the field of financial services (e.g. payment systems).

IT-enabled transformation is addressed by many researchers and consultants (e.g. Evans/Wurster 1999; Hagel/Singer 1999; Kelly 1998; Martin 1996). The main components of our approach are to identify best practices for electronic business, to propose reference architectures and reference business models, to combine method and model components into an appropriate methodological framework for IT-enabled transformations, and to participate in the design of business-related layers of a common collaboration infrastructure. All analyses and proposals are based on large, industry-funded research projects that leading Swiss and German companies conduct together with our institute.

Based on this introduction which focuses on IT-enabled business transformation, the main body of this paper is organized in two sections: In section 2, the discipline of business engineering is introduced with regard to its vision (business architecture and business models of the information age, section 2.1), its most important components (section 2.2), and its methods (section 2.3). The actors of business transformation, the business engineers, are addressed in section 3. Based on an analysis of their role in 'old' and 'new' companies (section 3.1), the market for business engineers is analyzed in section 3.2, and consequences for educational institutions are derived. The paper ends with some conclusions and directions for future research in section 4.

II. BUSINESS ENGINEERING

The technical and economical aspects of business transformations are far more complex to be 'created' intuitively by individuals without coordination and based on few, general rules. In order to systematically exploit business potentials of IT innovations, teams have to collaboratively assess and implement technologies, strategies, processes, and information systems.

Engineering disciplines are characterized by developing and applying methodologies, methods, and tools as well as by a professional, systematical, and collaborative approach. 'Business engineering' results from applying these basic principles of engineering disciplines to business transformation: Based on appropriate methods and models, professionals collaborate to transform companies or create new companies that exploit business potentials of IT innovations and apply new business paradigms. Business engineering is the design discipline for companies of the information age. Its primary theoretical foundation is method engineering (Brinkkemper/Lyytinen/Welke 1996).

Since business engineering is aimed at creating networked business architectures, such architectures as well as respective business models and infrastructures are presented at the beginning of this section. Based on that vision, important business engineering components are described and assigned to transformation tasks. As an general overview for the various transformation methods, system views, and design layers, a 'business engineering roadmap' is introduced.

BUSINESS ARCHITECTURE OF THE INFORMATION AGE

The most important business potential of IT innovations is that

- an advanced technical networking infrastructure together with
- an organizational business networking infrastructure

allow to broaden the transformation scope from an isolated company (or a company-centric view including direct customers and direct suppliers) towards entire value networks (Österle/Fleisch/Alt 1999). IT innovations that enable new business architectures include cheap, high-bandwidth communication networks, high-level (i.e. business oriented) communication standards, software packages for inter-company business processes, electronic markets, and successful business networking practices (e.g. alliances, flexible sourcing).

Parallel to the networking sophistication in the business arena, internet literacy and internet access are available to a growing portion of end consumers. By communicating directly with producers / service providers via electronic channels, end consumers can be integrated into

value networks more closely, and product / service design can be influenced more directly. Particularly for products bound to electronic media (e.g. information, music, movies, games, software) or financial products (e.g. loans, investments, insurance), the value network can be separated into a production-oriented 'factory' and a customer process-oriented 'solutions' portion. Since missing physical restrictions allow for a flexible combination / aggregation of such products / services, business models can be tailored to specific needs of customer segments instead of having to follow the structure of production processes.

Hence, two arenas contribute to the transformation to electronic business:

- Business-to-business arena ('business networking'): inter-company business processes, shared services and flexible sourcing, electronic marketplaces
- Business-to-consumer arena ('electronic business'): direct access and direct response to products and services by end consumers via electronic channels, separation of (mass-)production process oriented portions of value networks and (individualized or customized) combination / aggregation of products and services

In their combination, business networking and electronic business create huge optimization potentials for companies. Being an integral component of a value network, companies can identify promising business models more flexibly and can exploit core competencies more focussed, while overall efficiency and total customer value can be increased.

Most businesses will be more or less 'electronic' soon so that this adjective will loose its differentiation effect, especially as it is intensely exploited for commercial purposes. Therefore, we prefer the term 'business of / in the information age' for business models and business architectures that are based on business networking and electronic commerce. In figure 2, the general business architecture of the information age is illustrated.

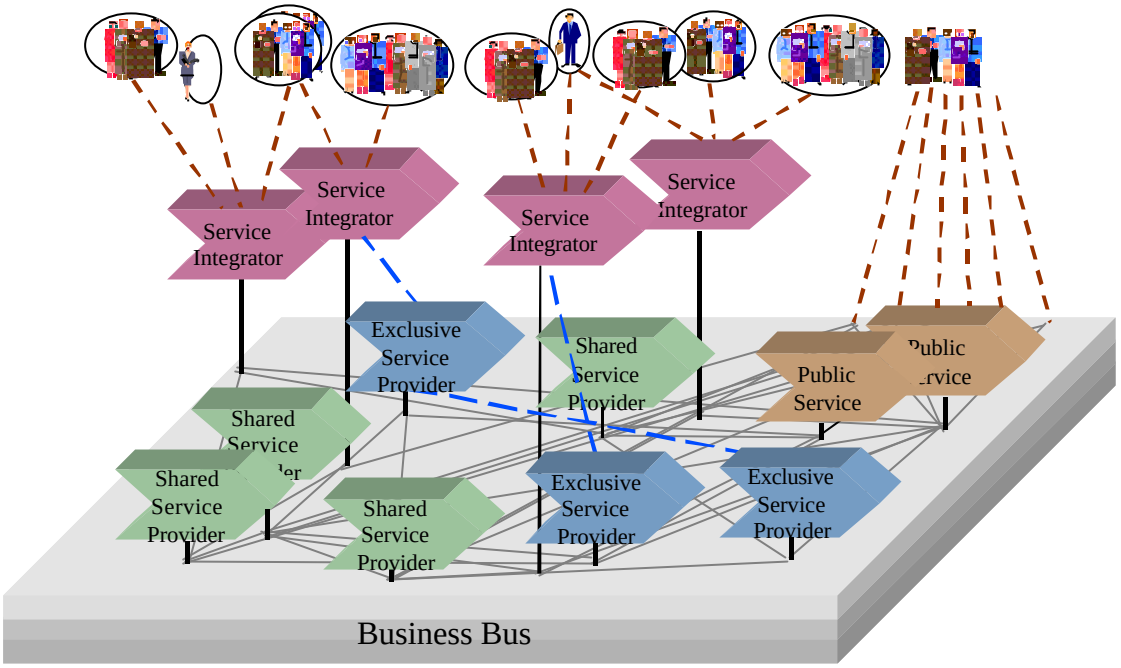


Figure 2: Business Architecture of the Information Age (Baumöl/Winter 2000)

The business architecture of the information age comprises components that implement certain roles which do not exist in traditional business architectures or at least are not pronounced to that extent (Österle 1999):

?? Customer processes become the focus of the value network design. ***Service integrators*** aggregate standardized product / service components produced by several service providers to create solutions that are tailored to a specific, holistic customer process (e.g. travelling, daily logistics) or a specific life event (e.g. retirement, marriage, moving to a new community). In most cases, information components become a more important solution component than in traditional products. Examples for existing service integrators are autobytel.com, yourhome.ch, or thirdage.com.

?? While most products / services are used by several service integrators, some products / services may be produced for only one or few service integrators (or service providers in later production stages). By providing such services, ***exclusive service providers*** contribute to an unique selling proposition.

?? While exclusive service providers are focussing on exclusivity, ***shared service providers*** produce large amounts of standardized products / services for use by a large

number of service aggregators. Shared service providers focus on mass production / mass customization and economies of scale. While it may be useful for exclusive service providers to maintain direct, exclusive networking links to service integrators, shared service providers need to use a common networking infrastructure for doing business with a large number of other service providers and service aggregators.

- The ***business bus*** is a flexible networking infrastructure that allows (shared) service providers and service integrators to exchange electronic products, electronic services, and information. To allow for efficient business networking, a large number of standards is defined not only on the lower, communication oriented layers of the business bus (e.g. EDIFACT, XML based standards), but particularly on the higher, business oriented layers (e.g. contracting standards, service level agreements).
- The business bus is complemented by several basic (electronic) services that are industry independent and process independent (e.g. certificates, payments, creditworthiness information). These ***public services*** are closely linked to the business bus.
- Most ***end consumers*** have access to products / services using service integrators. However, if end consumers wish to aggregate products / services by their own, they can access the business bus, too.

All types of service providers optimize their business models with regard to their production processes. In contrast, service integrators optimize their business models with regard to customer processes or customer life events, respectively. Business networking and the utilization of the business bus allow to separate production- oriented and customer process-oriented portions of the value network, thereby allowing different business models to exploit their respective core competencies.

The business architecture of the information age covers the business-to-business aspect as well as the business-to-consumer aspect of electronic business:

?? Business bus (including organizational standards), public services, and shared services (e.g. marketplaces, product / service components) make up an appropriate foundation for the flexible definition of business networks

?? Service aggregators are enabled to mass customize or even individualize products and services, thereby holistically supporting customer processes or life events

Figure 3 illustrates the evolution of business models when advancing into the information age. Electronic commerce can be interpreted as increasing virtual sophistication of access to / delivery of products that remain essentially unchanged. By using non-physical channels for access to and/or delivery of traditional products, mail order / phone merchants and finally .com-merchants have evolved from traditional merchants, and direct banks and finally Internet retail banks have evolved from traditional retail banks. This evolution dimension can be visualized by a vertical movement in figure 3.

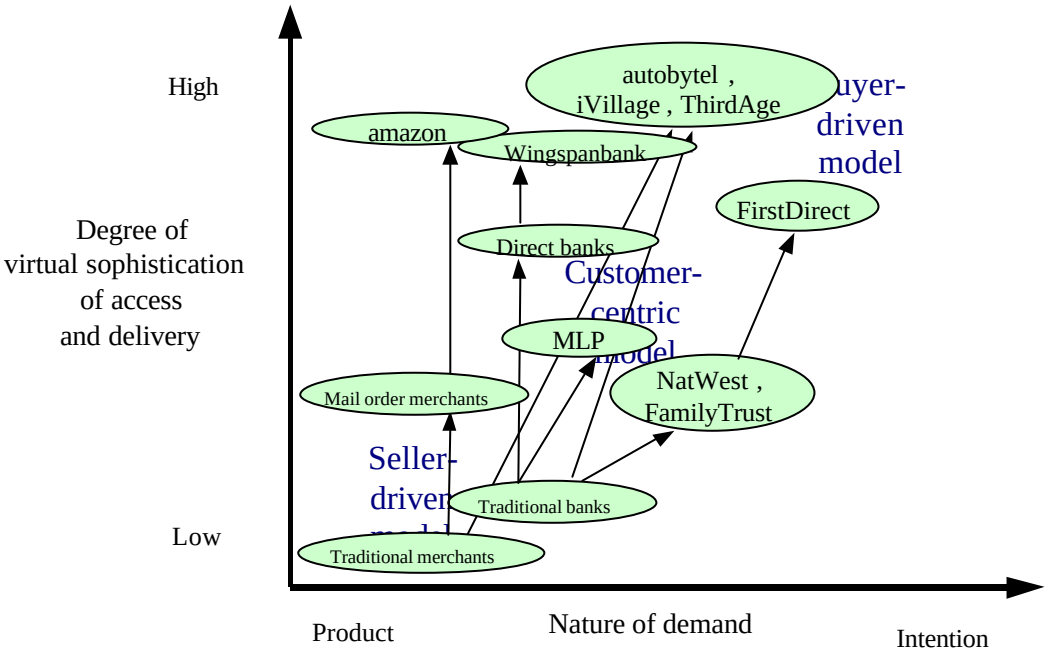


Figure 3: Evolution of Business Models (based on the classification scheme in Langlinais/deLeon 1999)

If, in contrast, products are aggregated to solutions which support customer processes or life events holistically, a different dimension of evolution occurs: E.g., car sales, used car valuation, selected banking products, selected insurance products, electronic market

functionality, and information services are aggregated into a car portal that supports the customer process 'buying a car' in its entirety. As another example, health information, selected travel services, selected moving services, selected financial services, selected communications services, etc. are aggregated into a senior citizen portal that supports the customer process 'managing for productive elder years' in its entirety. This evolution dimension can be visualized by a movement towards the upper right sector in figure 3; it usually includes electronic commerce elements (i.e. vertical movement).

BUSINESS ENGINEERING COMPONENTS

When analyzing the transformation process, technology assessment was introduced as one of the core techniques of business engineering. Mastering collaborative, transparent, and professional methods and models based on a sound, general methodology can be regarded as the core competency of business engineers. Since transformations affect man-machine-systems, it is not appropriate to restrict methodology to 'technical' aspects (i.e. information systems related issues). Of course, change / transition management, empathy, and comprehensive understanding of political and cultural aspects of change are not less important elements of a business engineer's toolbox. In order to design and implement transformation processes, a sound comprehension of business architectures of the industrial age (i.e. traditional business administration skills) is essential. Finally, it is necessary to envision business architectures and business models of the information age, i.e. to develop appropriate business strategies under inclusion not only of top management, but also of important partners within the value network and maybe even customers.

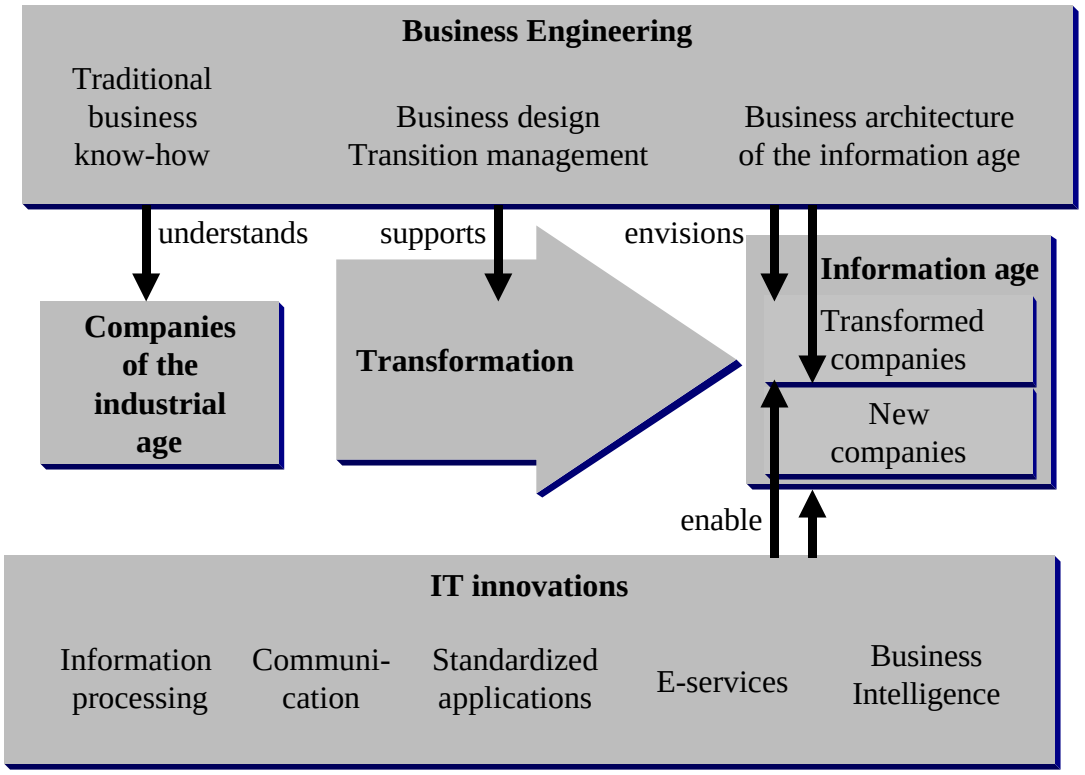


Figure 4: Business Engineering Components and Transformation Tasks (Österle/Winter 2000)

As illustrated in figure 4, three main business engineering components are needed to envision transformed and new companies, understand traditional companies, and design and implement the transformation process:

?? Traditional business know-how

?? Business design (strategy design, process design, systems design) and transition / change management (including empathy and understanding of political and cultural aspects of change)

?? Business architecture of the information age

By business engineering as a discipline, transformation agents in companies and administration are enabled to

?? create reference architectures and reference models for the information age,

?? apply a sound methodology including several 'tools' from general management, organizational development, organizational psychology, information management, communication management, and technology management, and

?? utilize a structured collection of transformation know-how and transformation tools.

An additional task of business engineering as a discipline is to take part in the design of the business bus. Of course, this participation is focussed on the business strategy, business process, and maybe information systems layers, not on the technical communication standards.

BUSINESS ENGINEERING ROADMAP

Although focussing on business transformation, the business engineering components presented above are related to a lot of different disciplines: business engineering is clearly a cross-disciplinary approach. As an overview of the most relevant layers and views of business engineering, the 'business engineering roadmap' (figure 5) is used. We differentiate two basic views:

?? Technical view: 'hard' factors of transformation projects, e.g. business processes and information systems

?? Political / cultural view: 'soft' factors, e.g. attitudes and power

From a technical viewpoint, business engineering provides methods and models for technology assessment, strategy development, process (re-)design, and systems development. From a political / cultural viewpoint, the primary focus in not on methods and models, but on leadership, empathy, motivation / communication skills, and a holistic perspective on organizations and change. Most methods and models for this view come from communication management, corporate policy-making, and organizational psychology.

The business engineering process is mostly triggered by the commercial availability of IT innovations (Moreton/Chester 1996) and the advent of novel collaboration / coordination models for business (Österle/Fleisch/Alt 1999). In some cases, changes of regulations, markets, consumer behavior, or common values can trigger transformations, too.

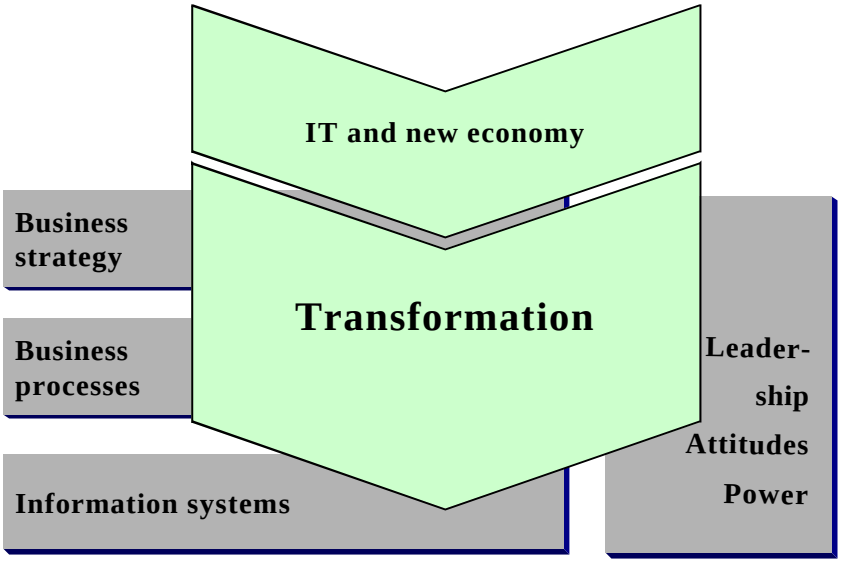


Figure 5: Business Engineering Roadmap (Österle/Winter 2000)

As a consequence, early phases of the business engineering process are closely related to technology and innovation management (e.g. Boutellier/Gassmann/v.Zedtwitz 1999). At the strategy level, the resulting business architectures, business models, and business architectures are developed. The St. Gallen general management model and its supplements (e.g. Gomez/Lauper/Probst 1991; Gomez/Rüegg-Stürm 1997) provide most of the methodological foundation of this phase. Based on appropriate business specifications, appropriate business processes must be (re-)designed. For this 'classical' phase of the business engineering process, a lot of proven methodology can be (re-)used (e.g. Davenport 1993; Österle 1995; Bach et al. 1996). Finally, large portions of specified business processes have to be supported by appropriate information systems. In this phase, the traditional methodology of systems development (with actual extensions for latest implementation techniques and application systems) is applied. According to the method engineering approach, at least the technical business engineering components are linked by a common meta model defining terms, roles, activities, and documents.

Parallel to the system related perspective of transformations, 'soft' issues like the human relations perspective (e.g. Hilb 1995) or the leadership perspective (e.g. Müller-Stewens 1997) have to be addressed. These components are usually documented by checklists, rules, etc. that cannot entirely be included in the common meta model.

RELATED APPROACHES

In contrast to the predominant empirical focus of most information systems research in the English-speaking world, business engineering is embedded in the constructivistic tradition of information systems research in the German-speaking countries (e.g. Scheer/Nüttgens 1999) as well as the normative tradition of the St. Gallen management model (e.g. Ulrich 1984). While other engineering approaches to the business domain focus on reference models derived from industry best practices (e.g. Scheer/Nüttgens 1999) or on systems development techniques enriched with 'soft skills' for successful systems implementation (e.g. Martin 1995), our approach is based on a vision of networked business architectures of the information age, a model-based approach to the (re-)design of organizations, and a set of methods developed in the context of information systems research, business administration research, and organizational psychology.

III. THE BUSINESS ENGINEER

Business engineers are needed to conceptualize, design, and implement transformations in companies and in administration. James Martin (1995) introduced the profile of an 'Enterprise Engineer' who has not only technical skills, but also various 'soft skills': Business engineers must

- ?? understand new ways of organizing workflows (including customers, suppliers, and other actors in the value chain) and corporate architecture,
- ?? have experience in all the disciplines for changing an enterprise, ranging from small-scale continuous improvement techniques to the principles governing organizational overhaul,
- ?? be instrumental in developing new information systems, and
- ?? understand the different layers of an organization's culture, both the formal and the informal culture. He/she must also understand how to overcome resistance to change.

While being essential for business engineers, business engineering is also an important skill set for other organizational roles: E.g., a controller which has to utilize an integrated software

package like SAP R/3 for his job or a marketing strategist which has to develop a customer relationship concept have to understand and assess IT potentials, align IT with company strategy, develop appropriate business processes, and use IT solutions in a most effective way. Companies and administration need a growing number of interdisciplinary transformation specialists. In this section, we first discuss the roles of business engineers in transforming organizations. In a second subsection, the analyze the job market for business engineers.

ROLES OF BUSINESS ENGINEERS

It was already mentioned that business engineers have an important role in (re-)design of organizational structures, business processes, and information systems (including the introduction of standardized software packages in companies). In transformation projects, business engineers act as internal consultants, as external consultants, or are involved as project managers. In companies which are characterized by a continuously high transformation rate, business engineers can also be found in general management positions. In a growing number of cases, business engineers are active in corporate startups or even in independent startups.

With the exception of startups and focussed, small companies in a value network, business engineers are usually found in large companies. This is due to the fact that the importance of methods and models for transformation projects (in contrast to an intuitive approach) is growing with an increasing sophistication (and usually an increasing size) of a company.

The qualifications of business engineers and dedicated business engineering programs at universities have been addressed in detail elsewhere (e.g. Winter 1999). To characterize the roles of business engineers in companies, the most important requirements are derived from the general transformation model (see figure 4):

The foundation of a business engineer's know-how are good business administration and industry skills (including software application and architecture knowledge). To envision novel business models and business solutions, he/she must understand the business architecture of the information age, i.e. he/she must have a deep knowledge of new business models, shared

business processes, networkability, and new business rules. Therefore, it is essential that he/she understands information technologies so that business potentials of IT innovations can be estimated. Furthermore, a collaborative conceptualization and implementation of transformation processes requires appropriate tools to be mastered (e.g. scenario simulation tools, enterprise modeling tools, process modeling/simulation tools, software package customization tools). While most of these qualifications refer to the technical view of business engineering, the political / cultural view of organizational change requires additional 'soft skills' such as leadership in change situations, empathy, and ability to motivate people.

Systems analysts / systems engineers were restricted to design and implement solutions while the solution's vision was created by business strategists in the past. Business engineers, in contrast, are involved in all stages of transformation projects from potential assessment via strategy-making and process engineering to systems design and implementation.

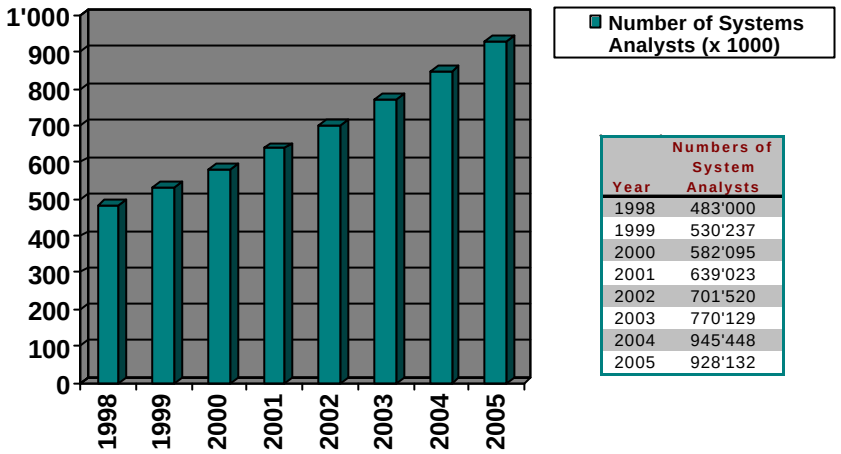
MARKET FOR BUSINESS ENGINEERS

We expect the supply of business engineers to become one of the most important restrictions of growth in the near future. Unfortunately, relevant surveys of the employment market focus on the traditional 'systems analyst' role rather than on the extended role model of the business engineer so that survey results are not transferable. Since systems analysts and business engineers, however, join a significant set of common qualifications so that, from all traditional roles in companies, systems analysts are closest to our notion of a business engineer, we expect that systems analysts job market trends will not differ significantly from perspectives for business engineers.

According to a study of Computer Research Association (1999), the US alone need about 400´000 additional systems analysts from 2000 - 2005 (see figure 6), while the aggregate output of all US universities over the same time period will be only 5´000 - 10´000. Similar gaps have to be expected in other world regions (CRA 1999).

Developed economies should assign additional resources to education institutions in order to create new study programs or to re-focus existing programs. When respective study

programs are designed, it should be taken into account that, while technical, 'hard' skills can be taught in traditional formats (e.g. formal lectures), 'soft' skills are closely related to project experience and personal maturity so that costly formats like group projects and coaching are necessary. Hence, it may be advised to differentiate pre-experience programs having technical focus from post-experience follow-up programs that allow for a holistic view on business engineering.



Year	Numbers of System Analysts
1998	483'000
1999	530'237
2000	582'095
2001	639'023
2002	701'520
2003	770'129
2004	945'448
2005	928'132

Figure 6: Demand Forecast for Systems Analysts (CRA 1999)

The university of St. Gallen has achieved good results by differentiating a full-time, pre-experience graduate program in information management (from 2001 on: Master in business innovation) and a part-time, post-experience executive MBA program in business engineering. While the pre-experience program is open to bachelors in business administration, computer science, and related disciplines, the post-experience program requires 3-5 years of professional experience in addition to a business administration, computer science, or related master degree. Both programs comprise lectures, group projects, and a master thesis. While the pre-experience program is full-time over a period of 18 months, the post-experience program comprises eight two-week modules and one four-week module, also over a period of 18 months. Since the university of St. Gallen is well-known for its holistic, normative approach to management education, both programs are currently unique at least with regard to the German-speaking countries.

IV. CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

Business Engineering is a composite discipline that combines components from general management, technology management, information systems, and organizational psychology into a method / model based, 'engineering' approach to corporate transformation. Business engineers should not only understand traditional business (including its political and cultural aspects) and apply transformation methodology, but also assess business potentials of IT innovations and envision novel business models. We expect a growing number of IT innovations and a decrease in regulations and restrictions to create more and more business potentials and transformation needs in the coming years. The already existing gap between business engineer demand and supply will be growing and creating limits to growth and innovation.

In our opinion and according to feedback both from partner companies and alumni, universities and corporate education facilities need to create additional qualification opportunities. While technical skills can be taught in traditional, pre-experience programs, part-time or corporate programs are necessary to enhance 'soft' skills for business engineers and convey a holistic business engineering vision.

With regard to industry-oriented university research, business engineering needs continuing efforts to integrate 'soft' disciplines into the meta model and extend the integrated methodology. The strategy level of business engineering, lagging for some time due to fundamental disputes over the role of IT for strategy-making, has recently benefited from a wide discussion of 'new economy' business architecture and business models. While financial services and supply chain management have been covered in detail, business architecture for other business sectors (e.g. transport, IT services, travel/leisure, TIME industries) have not been (re-)engineered so far. In addition, more methods and models for the strategy level (e.g. a maturity model for business in the information age) are currently developed.

REFERENCES

Bach V. et al. (1996) Enabling Systematic Business Change - Integrated Methods and Software Tools for Business Process Redesign, Vieweg, Wiesbaden.

Baumöl U. and Winter R. (2000) Intentions Value Network - A Business Model of the Information Age, Paper to be presented at the SIM 2000 Academic Workshop, Brisbane.

Boutellier R. and Gassmann O. and von Zedtwitz M. (1999) *Managing Global Innovation*, Springer, Berlin.

Brinkkemper S. and Lyytinen K. and Welke R. (1996) *Method Engineering*, Chapman & Hall, London.

The Computer Research Association (CRA 1999) *Computer Technology Research*, cited in: U.S. Department of Commerce, America´s New Deficit: The Shortage of Information Technology Workers, http://www.ta.doc.gov/Reports.htm (download at 1999-02-14).

Davenport P. H. (1993) *Process Innovation: Reengineering Work through Information Technology*.

Evans P. and Wurster T.S. (1999) *Blown to Bits. How the new Economics of Information transforms Strategy*, Havard Business School Press.

Gomez P. and Lauper P. and Probst F. (1991) *Networking Thinking in Strategic Management*, Ciba Geigy, Basel.

Gomez P. and Rüegg-Stürm J. (1997) On the Essence, Emergence and Effects of Visions: Some Cautions, in *Corporate Transformation* (Sinatra A., Ed.), Kluwer, Dordrecht, 69-93.

Hagel J. and Singer M. (1999) *Net Worth – Shaping Markets When Consumers Make the Rules*, Harvard Business School Press.

Hilb M. (1995) Core Business Process Re-Engineering: A Human Resource Management Perspective, in *Business Process Re-Engineering: A Multi Discipline Perspective* (Armitead C.G. et al., Eds.), John Wiley & Sons, London, 10.1-10.15.

Kelly K. (1998) *New Rules for the New Economy. 10 Radical Strategies for a Connected World*, Penguin.

Langlinais T. and deLeon A. (1999) Winning the e-economy with "Intention Value Networks", *EIU Strategic Finance*, March to May 1999, 50-68.

Martin J. (1995) The Enterprise Engineer, *Computerworld*, 18.9.1995.

Martin J. (1996) *Cybercorp – the new business revolution*, amacom, New York.

Moreton R. and Chester M. (1996) *Transforming the Business – the IT contribution*, McGraw-Hill, London.

Müller-Stewens G. (1997) Fundamental change in highly complex organizations: The connectivity of leadership interventions as illustrated by the example of Daimler-Benz AG, in: *Corporate Transformation* (Sinatra S., Ed.), Norwell, 132-152.

Österle H. (1995) *Business in the Information Age - Heading for New Processes*, Springer, New York.

Österle, H. (1999) Enterprise in the Information Age, in: (Österle/Fleisch/Alt 1999), 15 ff.

Österle H. and Fleisch E. and Alt R. (1999) *Business Networking. Shaping Enterprise Relationships on the Internet*, Springer, Berlin.

Österle H. and Winter R. (2000) *Business Engineering* (in German), Springer, Berlin.

Scheer A.-W. and Nüttgens M. (1999) *Electronic Business Engineering* (mostly in German), Physica, Heidelberg.

Ulrich H. (1984) *Management*, Haupt, Bern.

Winter R. (1999) HSG Master of Business Engineering Program - Qualifying High Potentials for IS-enabled Change, in: Pries-Heje J. et al. (Eds.): *Proc. 7th European Conference on Information Systems*, Vol. 3, Copenhagen Business School, 819-826.