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Federico Rotini
Yuri Borgianni
Gaetano Cascini

Re-engineering of Products and Processes

How to Achieve Global Success
in the Changing Marketplace

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Preface

An abundant amount of literature regards the twenty first century as the innovation era, where shared knowledge fosters the progress with a strong impact at the economic and social levels. As a consequence, the capability to innovate will play a growing role in the destiny of companies. In the transition between quality-oriented and innovation-driven competition, considerable difficulties are faced by those firms, whose management mindsets have not assumed knowledge and innovation as a central asset of industries. With reference to such problems much academic research has been carried out in order to deal with continuous innovation programs, but the proposed indications have not resulted yet sufficient to master the competition, avoiding waste of resources and wrong decisions.

The debate about innovation and especially the factors that determine the success of innovation initiatives is rich and thought provoking. Scholars from different domains, especially business management, engineering, and computer science have disputed about the priority of the measures to be attained to achieve effective innovation tasks. Several models and strategies are grounded in concrete evidences from successful experiences. Is any proposed model capable to describe and justify any kind of successful innovation initiative? The authors' answer is "no" and we are convinced to share this opinion with the wide majority of industrial experts, researchers and readers. We believe that no tool has been developed to support the whole innovation cycle and to cover any aspect (strategic, technical, managerial, etc.) regarding industrial approaches to innovation.

Undoubtedly, this book cannot fill the gap. The issues that are treated to infer the motivations of the work are surely not exhaustive in the panorama of innovation strategies. Much academic research and industrial practice is still needed to build rigorous models and efficient tools. However, we are convinced that such a manuscript and the presented techniques can result in a useful support to industries facing the need to undertake decisions about the renovation of processes and products and a valuable contribution to researchers and PhD students who are interested in the field.

The whole coverage of this book swivels on a basic assumption, that results unopposed in the literature and that we have considered as a fundament for the

book: the capability to provide customer value is a primary driver in achieving business success. According to our studies and background, such hypothesis can be deemed valid in both static and turbulent stages that characterize the paths of evolution encountered by goods and services. If the focus on value contributes to sustain successful business, all innovation initiatives, being addressed at products or processes and providing radical or marginal changes, cannot overlook their potential impact on customer satisfaction. In such a perspective, the combined set of presented value-oriented methodologies, namely Integrated Product and Process Reengineering (IPPR), constitute the core of a toolkit for the identification of the most favorable directions within innovation initiatives. IPPR represents a system to support crucial decisions in the industry, capable to orientate choices among a set of plausible reengineering activities, according to value criteria. The methods that we illustrate in the present publication deal with different specific objectives and conditions encountered along industrial production, research, and planning. Actually, three recurring situations are taken into account, that typically take place along product lifecycle: the birth of new products and the organization of suitable processes, their maturity often accompanied by lacks of competitiveness, the need to drastically rethink the outputs that are offered to customers.

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Chapter 1

Introduction

1.1 Generalities of the Reengineering Strategies

By treating the problems related to products and processes, thus the outputs of industrial activities and the ways to achieve them, a large range of business, technical and organizational features have to be taken into account.

The present Chapter first overviews general and comprehensive models that attempt to deal with a large range of the recalled aspects and provides the relevant definitions for the main concepts encountered in the book. According to this aim, this Section illustrates the main notions concerning Business Process Reengineering (BPR) and New Product Development (NPD), in order to facilitate the reading and understanding of the investigated topics. The field of BPR includes a broad set of techniques to approach the task of improving the internal processes, by optimizing the allocation of resources, the employment of skills, the performances of the end products, etc. Conversely, NPD groups the most common practices undertaken to innovate products and services.

[Section 1.2](#) is dedicated to point out the product lifecycle phases that are addressed and supported by the instruments described in the book. A more detailed review of the subjects of interest is presented in [Sect. 1.3](#), that eventually points out the main identified deficiencies and open issues with reference to the surveyed methodologies and models. Finally, [Sect. 1.4](#) clarifies the purpose of the book, addressing the general goals and the methodological objectives to be attained by building a versatile system to support decisions in troublesome industrial contexts.

1.1.1 Redesigning Business Processes

The concept of “*business process*” was born in the early 1990s as a means to identify all the activities that a company performs in order to deliver products or services to their customers. The need of describing and formalizing the actions

performed to turn resources into benefits for the customer was strongly perceived in those years since companies started worldwide to radically reorganize their activities in the attempt to regain the competitiveness lost during the previous decade. The “business process” concept has been defined by several authors in the literature with the aim of providing a reference for modelling and analysis tasks.

Davenport [1] stated that it is “*a structured, measured set of activities designed to produce a specific output for a particular customer or market. It implies a strong emphasis on how work is done within an organization, in contrast to a product focus’s emphasis on what. A process is thus a specific ordering of work activities across time and space, with a beginning and an end, and clearly defined inputs and outputs.... Processes are the structure by which an organization does what is necessary to produce value for its customers*”. Thus, according to Davenport, a business process is identified through clear boundaries, inputs, outputs and activities ordered in time and space: the purpose of the process is the transformation of inputs into outcomes having value for the customer.

Hammer and Champy [2] give a more general definition focused on the process outcomes according to the customer perspective: “*a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer*”.

Eventually Johansson et al. [3] emphasizes on the creation of links and inter-relations among the activities and on the transformation that takes place within the process, highlighting the value chain concept: “*a set of linked activities that take an input and transform it to create an output. Ideally, the transformation that occurs in the process should add value to the input and create an output that is more useful and effective to the recipient either upstream or downstream*”.

Plenty of definitions have been proposed, but in essence all have the same meaning: business processes are basically relationships between inputs and outputs, where inputs are transformed into outputs throughout a series of activities, which add value to the inputs.

According to the cited contributions, a business process should be therefore characterized by (Fig. 1.1):

- clearly defined boundaries, inputs and outputs;
- activities ordered in time and space;
- a clearly identified beneficiary of the process outcomes, e.g. the customer or any stakeholder;
- the transformation taking place within the process that is meant to add value to the inputs;
- an organizational structure;
- one or more functions to be performed.

Such properties suggest that the business process can be considered as a technical system able to generate value by manufacturing products or delivering services under certain boundary conditions such as market demand, raw material availability, product requirements, technology and know-how resources, etc. When the process is not able to exploit the available resources according to their

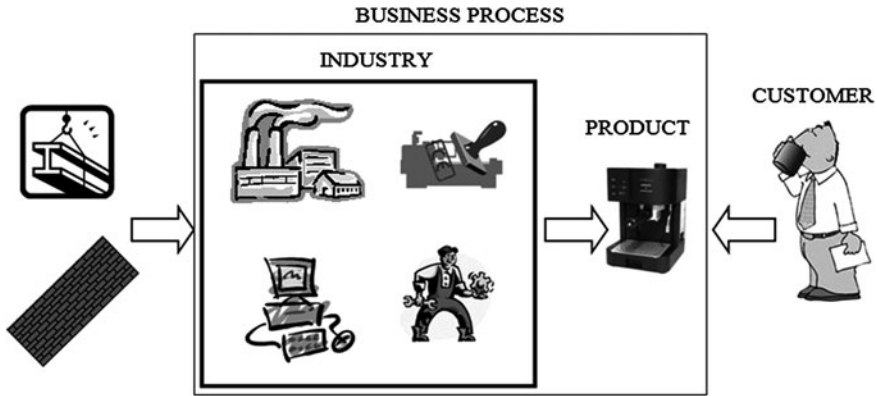


Fig. 1.1 Elements constituting a business process

potentialities, its capability to survive market competition decreases dramatically, due to a disadvantageous balance between the provided benefits and the involved costs. Thus any organization has to pursue continuous business improvements through planned evolutionary paths in order to preserve its competitiveness; this evolution can involve the business at different levels and it requires resources of knowledge dispersed across different fields and disciplines.

During the last twenty years, many methods have been suggested to address the redesigning and innovation of business processes. In the management field, but also in the scientific literature, such reorganization tasks were grouped under the name of Business Process Reengineering (BPR) activities. Several definitions of BPR are available but one of the most acknowledged is that provided by Hammer and Champy [2], who depict it as “*the fundamental rethinking and radical redesign of a business process to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed*”.

In line with the above definition, IPPR provides appropriate hints to direct the process reengineering efforts towards solutions that comply with products quality, customer satisfaction, resources savings and suitable sequences of phases to achieve such issues.

1.1.2 Rethinking Products and Business Models

In particular circumstances, it is required to radically redefine the outputs of the business process, rather than to rethink the ways to generate them; as a result, the core of the innovation task shifts towards redesigning, manufacturing and delivering new products. In this context, NPD cycles are typically concerned as conjoint activities involving business, marketing and technical expertise within companies. The continuous information exchange among the various units of the firm debates

about the feasibility of new products, the knowledge required during the development stage, programs for resources allocation, the financial sustainability of the project, the target group of expected users, the foreseen response from the customer arena, the commercial strategy, etc.

Besides, it is acknowledged how the destiny of NPD initiatives is mainly determined during the Fuzzy Front End of the design cycle, i.e. the initial phases, when the design process appoints the fundamental aspects of the new goods [4–6]. In such segment of the development task the human needs to be satisfied are crucially individuated and represent the main trigger for exploiting business opportunities. Clearly identified customer requirements are regarded as the inputs for the conceptual design, whereas product specifications are defined and eventually conflicting demands are faced throughout problem solving tools. The NPD cycle is therefore grounded on the set of requirements to be fulfilled, which in turn provide value for the target customers. The beginning of the development process captures plenty of the characteristics related to the final commercial offer, ranging from the identity of the company which strives to address unspoken needs to technical performances to be achieved in order to cope with established exigencies. In this sense the NPD task commences by giving prominence to the ways to manifest the culture of the company, the position it is ought to be gained in the marketplace, novel paths intended to deliver value to customers and thus, altogether, what we can identify with the concept of “*business model*”.

From a historical perspective, the wide diffusion of the “business model” term is consistent with the growing role played by Internet and particularly by the e-commerce in marketing activities. By the 1990s of the previous century, the adoption of web retailing was considered as a sort of mantra for determining companies’ fortune. Despite such enthusiasm, numerous e-commerce experiences resulted in tremendous flops, as surveyed by Mahajan, Srinivasan and Wind [7], because of their lack of strategy within flawed business models [8]. As a consequence, the notion of business model started to assume a wider meaning and to identify patterns of value creation by exploiting business opportunities [9]. On the same wavelength Chesbrough and Rosenbloom [10] individuate the primary objective of the business model in the proposition of the value necessary to provide commercial interest to technological advances. In more general terms Francis and Bessant [11] address the objectives of *business model innovation* in the “*reframing of the current product/service*”, thus allowing to individuate “new challenges and opportunities”. In order to fulfil the task, Johnson et al. [12] depict Customer Value Proposition as the first step in the creation of an alternative business model with the aim of fulfilling unsatisfied needs.

The efforts to redesign business models, and consequently NPD tasks, are therefore associated with value innovation initiatives. Value innovation is acknowledged, also within studies about entrepreneurship, as a fundamental strategy to obtain competitive advantage by proposing value profiles that deviate from previous industry standards. The renewal of business models is intended as a means to achieve differentiation from competitors in ways valued by market [13, 14], assuming distinguishing features with respect to any other sort of

disruptive innovations [15]. Indeed, such kind of innovations fundamentally redefines the market boundaries through New Value Proposition (NVP) initiatives that emphasize on previously overlooked product or service attributes, which result valuable for the customers. In this perspective Gotzsch, Channaron and Birchall [16] emphasize the value provided by communicative capabilities of products, especially when the main features, e.g. performance and price, have reached their maturity.

In order to clarify the meaning of the introduced terminology, within the present book we depict a *value profile* (or *value curve*, with the reference to the graphical model introduced by Kim and Mauborgne [17]) as a *bundle of properties and features, characterized by their performance or offering level, belonging to a product (or service), which generate benefits for the user*. Such features are indicated throughout the text with attributes (as observed through the lenses of end users) or customer requirements (from the viewpoint of the enterprise), whereas the *product* they belong to, is intended as *the output of the business process, thus a set of tangible items and matched delivered services*. Moreover we exploit the definition provided by Barnes, Blake and Pinder [18] who identify a value proposition as “*a clear, compelling and credible expression of the experience that a customer will receive from a supplier’s measurably value-creating offering*”. As a result NVP pursues the objective of differentiating value profiles from those existing in the industry, with the attempt of developing new generations of products and services that enhance customer satisfaction by offering in a synergic way additional benefits and unprecedented experiences.

1.2 Classes of Reengineering Problems

Facing innovation issues, companies typically have to pursue the double goal of delivering customer satisfaction and carrying out industrial processes with a limited amount of expenditures and consumed resources. This implies that the development of products and processes involves tangled interrelations between companies policies and the features affecting the market and the customer perception.

In a simplified vision, as already advanced by Miles’ Value Engineering [19], the firms have to maximize the ratio between the profitability of the delivered products and services and the costs pertaining the business process. By considering the profitability directly related with customer satisfaction, quality oriented tools have been developed to increase the numerator of the ratio. A wide diffusion in the industry regards the *Quality Function Deployment* [20], a mathematical model to maximize customer satisfaction by individuating the most advantageous combination of product attributes performance within the range of feasible technical solutions. On the other hand, the most diffused BPR strategies are aimed at shrinking the production costs (thus minimizing the denominator), by eliminating all the superfluous expenditures and thus obtaining lean processes. In such framework, most of the work has been dedicated to optimize the terms of the fraction (benefits and costs), rather than the ratio as a whole. Within the landscape of reengineering techniques, the