



University of Pennsylvania
ScholarlyCommons

Health Care Management Papers

Wharton Faculty Research

8-2014

Managing Customization in Health Care: A Framework Derived from the Services Sector Literature

Etienne Minvielle

Mathias Waelli

Claude Sicotte

John R. Kimberly
University of Pennsylvania

Follow this and additional works at: https://repository.upenn.edu/hcmg_papers

 Part of the [Health and Medical Administration Commons](#), and the [Medical Humanities Commons](#)

Recommended Citation

Minvielle, E., Waelli, M., Sicotte, C., & Kimberly, J. R. (2014). Managing Customization in Health Care: A Framework Derived from the Services Sector Literature. *Health Policy*, 117 (2), 216-227. <http://dx.doi.org/10.1016/j.healthpol.2014.04.005>

This paper is posted at ScholarlyCommons. https://repository.upenn.edu/hcmg_papers/149
For more information, please contact repository@pobox.upenn.edu.

Managing Customization in Health Care: A Framework Derived from the Services Sector Literature

Abstract

Organizations that provide health services are increasingly in need of systems and approaches that will enable them to be more responsive to the needs and wishes of their clients. Two recent trends, namely, patient-centered care (PCC) and personalized medicine, are first steps in the customization of care. PCC shifts the focus away from the disease to the patient. Personalized medicine, which relies heavily on genetics, promises significant improvements in the quality of healthcare through the development of tailored and targeted drugs. We need to understand how these two trends can be related to customization in healthcare delivery and, because customization often entails extra costs, to define new business models. This article analyzes how customization of the care process can be developed and managed in healthcare. Drawing on relevant literature from various services sectors, we have developed a framework for the implementation of customization by the hospital managers and caregivers involved in care pathways.

Keywords

healthcare management, personalized medicine, mass customization, patient centered care

Disciplines

Health and Medical Administration | Medical Humanities



Managing customization in health care: A framework derived from the services sector literature



Etienne Minvielle^{a,*}, Mathias Waelli^b, Claude Sicotte^c, John R. Kimberly^d

^a EHESP, MOS-Institut Gustave Roussy, France

^b EHESP, MOS-Institut du Management, France

^c Montreal University, Canada

^d Wharton School, United States

ARTICLE INFO

Article history:

Received 5 January 2014

Received in revised form 4 April 2014

Accepted 9 April 2014

Keywords:

Healthcare management

Personalized medicine

Mass customization

Patient centered care

ABSTRACT

Organizations that provide health services are increasingly in need of systems and approaches that will enable them to be more responsive to the needs and wishes of their clients. Two recent trends, namely, patient-centered care (PCC) and personalized medicine, are first steps in the customization of care. PCC shifts the focus away from the disease to the patient. Personalized medicine, which relies heavily on genetics, promises significant improvements in the quality of healthcare through the development of tailored and targeted drugs. We need to understand how these two trends can be related to customization in healthcare delivery and, because customization often entails extra costs, to define new business models. This article analyzes how customization of the care process can be developed and managed in healthcare. Drawing on relevant literature from various services sectors, we have developed a framework for the implementation of customization by the hospital managers and caregivers involved in care pathways.

© 2014 The Authors. Published by Elsevier Ireland Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

1. Introduction

This article addresses key issues relative to care customization in healthcare delivery and proposes a pragmatic framework to study and guide its management.

From the patient's point of view, care customization has always been an important aspect of quality in healthcare. Every patient wants to feel that he/she is getting the care that is tailored to his/her particular needs [1,2]. As the traditional notion of the "doctor-patient relationship" implies, customization is at the core of the conception of care for health professionals. As in other sectors, a

customized service is perceived not only as better quality but also as more attractive, thus allowing a premium to be charged.

Two relatively new concepts, *patient-centered care* (PCC) (organizing patient management to meet the needs of the individual patient) and *personalized medicine* (tailoring therapy to the patient's biological characteristics and in particular to their genetic profile have the potential to enhance customization of care substantially) have each generated a great deal of interest and investment and have developed independently. We see significant potential for them to be integrated and introduced into day-to-day patient management, yet we know of no attempts, either conceptually or practically to do so. There is a need to understand both how they might be integrated and whether the underlying economics make it feasible.

If the notion of customization of patient management in a clinical and economically practical way is relatively

* Corresponding author at: Gustave Roussy, 114 rue Edouard Vaillant, 94805 Villejuif Cedex, France. Tel.: +33 1 42 11 49 89.

E-mail addresses: etienne.minvielle@gustaveroussy.fr, etienne.minvielle@igr.fr (E. Minvielle).

new to the healthcare sector, it is at the core of what is known as mass customization in industry. Mass customization in industry has been defined by Davis as “*the production of personalized or custom-tailored goods to meet consumers’ diverse and changing needs at near mass production prices*” [3]. The principle of mass customization cannot, however, be transferred directly to healthcare but must be adapted to the complexity of care delivery systems. Our aim in this paper is to propose a framework for adapting the principles of mass customization to achieve the greatest amount of customized care at the lowest cost in health care.

2. Patient management as a production process

Three different sets of actors play a role in healthcare delivery and patient management: caregivers working in healthcare organizations or care pathways, managers who are in a position to implement organizational changes in care processes (the quality manager, the head of the medical performance analysis department, or some other senior executive, depending upon the division of duties within the organization) and, finally, the policy-makers (government ministries or agencies) who can influence priorities and needed resources. In short, the policy-makers decide on the changes to be made at the macro-level, the managers decide how these changes will be carried out at the meso-level, and the caregivers decide who will do what and when (work organization) at the micro-level. Coordination among these three roles is an ongoing challenge, and for this reason, a common framework for care customization that will align these stakeholders in their efforts to deliver individualized care within an acceptable time and cost frame is needed.

The context within which patient management takes place can, in general, be described as follows: ever **faster delivery** of appropriate care because of ever tighter budgets; a wider choice of advanced medical technologies available for patient care, necessitating **greater coordination** among staff; more interventions within an ambulatory care setting, while **eliminating hospital-to-hospital transfers**; an increasing **emphasis on patients and their relatives** as beneficiaries of a service; an expectation that better informed **patients** with greater freedom of expression **can help co-design and co-produce the care process** and will thus encourage patient self-management [4]. In short, the context is complex and customization of a process where time is crucial, the steps making up the process are highly diverse, interaction with patients and relatives is high and that occurs on a large scale (more than a thousand processes a day in some healthcare organizations), represents a huge challenge in management. It is the challenge of managing the uniqueness of each patient on a large scale in order to achieve higher patient clinical outcomes and service better tailored to meet patient needs under tighter budgets.

3. Toward customization: personalized medicine and patient centered care

Customization is not totally absent from healthcare, but its link with the intervention it qualifies is often not

explicit. An example of this is the customization in hand-over training in order to ensure continuity of care [5] and use of information technology (IT) to share information and improve interactivity. Nonetheless, there is no global integrative approach to customization in healthcare in these initiatives. Personalized medicine and patient-centered care are also steps toward customization, but each one has its limitations and they are not linked managerially.

Personalized medicine is a focal point of current clinical and translational research. The rapies tailored to increasingly narrow patient segments on the basis of the patients’ genetic characteristics have been developed, and improved treatments for diseases such as breast cancer and hepatitis C [6] have already been put into practice. The new knowledge acquired by the use of novel pharmacogenomics techniques is expected to induce major quality improvements with regard to personal health planning, early diagnosis, prescribing the right drug for the right patient, and predicting treatment side effects.

The linkage between personalized medicine and better health has so far been biologically driven, as the emphasis has been on actions designed to reveal the appropriateness of a given treatment in biological terms [7]. Interventions based on the socio-economic status rather than biological characteristics of patients have been less critical to improving health and are more geared toward ensuring social equity. However, quality of care is determined not only by the treatment but also the organization of the clinical pathway within which treatment is delivered [8]. Personalized medicine – which relates to treatment strategies– and care customization – which relates to the overall care process – complement each other [9]. Care customization translates personalized medicine into clinical practice by redesigning care delivery processes from the early decision-making stage (disease management and choice of treatment) right through to patient follow-up and counseling.

There is also an evident link between Patient-Centered Care (PCC) and care customization. In 1988, the Picker/Commonwealth Program for Patient-Centered Care (now the Picker Institute) coined the term Patient-Centered Care to call attention to the need for clinicians, staff, and healthcare systems to shift the focus away from diseases and back to the patient and family [10]. The Institute of Medicine (IOM) defined PCC as “care that is respectful of and responsive to individual patient preferences, needs, and values” and that ensures that “patient values guide all clinical decisions” [11]. Its wide-ranging definition lists the attributes of the design of a service from a patient’s point of view: respect for the patient’s ideals; coordinated and integrated care; clear, high-quality information and education for the patient and family; physical comfort; emotional support and alleviation of fear and anxiety; involvement of family members and friends, as appropriate; continuity including care-site transitions and access to care [12].

Furthermore, PCC would benefit from a more integrated and coordinated process of care such as greater care customization but first there needs to be a better understanding of the experience of illness and of how to address patients’ needs within complex and fragmented healthcare delivery systems [13,12]. There are two important differences between PCC and care customization.

The first is a difference in the weight and priority given to process uniqueness and process comprehensiveness. Care customization deals with the uniqueness of each care process whereas PCC seeks comprehensiveness. Care customization requires definition of criteria (i.e., patient categories) in order to be integrated effectively into the care process, whereas PCC seeks to introduce large-scale actions (no patient categorization). The second difference is in the management level at which intervention occurs. Care customization focuses on the micro level of management, requiring the use of new IT and organizational tools whereas PCC focuses on guidelines for a patient-driven approach at both the service delivery and systems levels.

4. Adapting mass customization approaches

Development of mass customization first led to the introduction of new forms of analysis in areas such as services marketing, human resources management, logistics, and supply chain management [14,3,15]. The literature reviews of 2001 and 2012 by Da Siveira and colleagues [16], highlighted the key role of customer demand and market conditions in mass customization, with mass customization being a way of differentiating companies in a highly competitive and segmented market. Since the late 1980s, customers' experiences and operation management initiatives have been used to design personalized goods or services in many activity sectors (e.g., auto manufacturing, media and entertainment) but still, implementation of mass customization has always had to await the spread of new generation IT systems before being able to offer variety at low cost [17].

The relationship between standardization and adaptation in the implementation of mass customization in the work organization has always been a subject of debate. In 1987, Davis remarked that standardization had to match individual needs better [3]. There was lively debate over the difference between mass customization and mass production in the 1990s [16] with Pine and his colleagues arguing that they were incompatible [18]. In 1996, Lampel and Mintzberg [19] described the general principles of customization as applicable to various activity sectors including healthcare. According to this model, customization and standardization were not considered as alternatives but rather as poles in a continuum of real world strategies. In their view, the nature of the activity determines the level of customization and can range from "customized standardization" (cataract) to high-level "pure customization" (complex surgery) (Table 1). We have adopted the same attitude but since there were no guidelines provided on how to develop customization in healthcare delivery at the level of work organization, we have extended this model for use as a practical framework that is intended to help healthcare managers meet several challenges in managing customization of care.

Customized industrial processes are typically divided into five steps (design, manufacturing engineering, assembly, realization, and evaluation) with the three middle steps (manufacturing, engineering, realization) mainly focusing on the production of goods rather than of services. We combined the three middle steps into a single middle step

denoted "service delivery", a step that is an interactive process co-managed with the beneficiary.

Adapting mass customization successfully to health care has to overcome several barriers: (i) because it defies traditional cost analysis, it requires innovative business models in which customization and cost control are jointly optimized; (ii) it requires an understanding of how the point of view of the beneficiaries of the service (patients and their relatives) can be taken into account. Patients who are under stress from illness, uncertain about their clinical status, and in a subordinate situation because of a lack of information can express their needs and wishes in a manner so forceful that it may jeopardize any attempts made at customization; (iii) it requires an understanding of how to combine the use of information technologies and the workforce in the same work organization in order to reengineer the care process; it will also encounter the currently fashionable logic of evidence-based medicine, which standardizes professional practices while care customization has the aim to manage the uniqueness of the process at the organizational level; (iv) it requires wisdom in the choice of the criteria on which care customization is based, as care customization is subject to opposing objectives. On one hand, because the main goal of hospital managers is to provide outstanding service to their customers this might motivate the development of new procedures, programs and market-approaches to attract new, possibly profitable customers. On the other hand, because hospital managers are also public health decision-makers, they may prefer to customize services for the patient populations that are the most vulnerable and most in need of access to care.

5. How did we develop our framework?

Our framework was grounded in a two-part literature search and review carried out by two of the authors (EM, MW). The first part identified key factors in a variety of services sectors that might prove relevant to customization of services in healthcare through a search on Web of Science, EBSCO and CAIRN databases using the following combinations of key words: "mass customization" AND "service" (the term "service" was included as it is a key attribute of the care process) and "personalized service" AND "management". We focused on all articles and books that developed comprehensive frameworks for mass customization or its implementation, regardless of sector of application. The second part identified articles and books on care customization in healthcare organization and delivery. We searched PubMed (1992–2012) using the keywords "personalized medicine", "care customization", and "patient-centered care" either alone or in two combinations: personalized medicine AND care customization, patient-centered care AND care customization. We excluded articles on just general and not specific aspects of care customization in healthcare delivery. Our goal was to establish an explicit link between the factors needed for implementation of mass customization (Part 1) and the initiatives already implemented in healthcare (Part 2). When regular trends in certain factors appeared, (e.g., use of IT), we discontinued analysis of articles on that factor.

Table 1

Continuum of strategies from pure standardization to pure customization as inspired by Lampel and Mintzberg's model. Comparison between healthcare and other sectors.

	Pure standardization	Segmented standardization	Customized standardization	Tailored customization	Pure customization
	Standardized = from design to distribution	Consumers have more choice but no influence on the production process	Assembly is customized	Manufacture is customized	Customer's wishes are part of the design process
Other sectors	Ford T ("any color as long as it is black")	Proliferation of cereal brand	Build-a-bear, IKEA kitchen	Personalized birthday cake	Residential architect
Healthcare	Drugs' prescription	Confort room, i.e., a place set aside for stressed patients or their relatives	Cataract	Appendectomy, drug prescription for nervous disorder	Complex interventions, cancer therapy

The title and abstract of retrieved articles and the summary of referenced books were used to select documents for a more in-depth analysis. All abstracts were submitted to double-blind review (EM and MW). EM is a physician and a management science researcher with 20 years' experience in hospital quality and MW is also a management science researcher. Differences in abstract selection and/or interpretation by the two reviewers were resolved through discussion. Our article selection method met the code rules defined by Hart for the handling of large numbers of references [20]. A total of 740 items were selected in Part one and 560 in Part two of our literature review. Bibliographies of selected articles were hand-searched to retrieve all cited articles relevant to our purpose. The final selection included 94 articles and books, which were all read in full (Appendixes 1 and 2).

6. Description of our framework for implementation of customization in healthcare: the 6 key factors

Our literature review identified six factors that could be related to the three steps (design, service delivered and assessment) making up our framework for the implementation of customization in the care process. One factor was related to the design step (F1 = categorization, i.e., the better segmentation of patients in order to adapt service to patient profile), three factors were related to the technological and human factors involved in the service delivered (F2 = IT use, F3 = developing service skills and F4 = patient self-management) and two factors were related to assessment, i.e., whether the service provided met patients' needs and was financially sustainable (F5 = patients' experiences and F6 = economic impact). In the description of the six factors below, we first indicate the source of the factor (Part one of our literature review) and then factor use and/or potential according to both literature reviews on mass customization and customization in healthcare (Part two).

6.1. Step 1: design; F1: categorizing patients

Part one: In Consumer Relationship Management (CRM), customer categorization is the first step in the design of a personalized service [21,22].

Part two: Patients are usually categorized according to their clinical characteristics and increasingly, whenever

possible, by their genetic profile [23]. They can also be classified according to psychological, social or economic status. Patients' needs and behavior depend on their age, cultural background and social origins. Socio-economic criteria could be used to build patient categories needing closer personalized care (high health service users) or resistant to standardization ("the worst of the worst") as in Gawande's hotspots mapping technique [24]. Categorization could also be used to identify preventable behavioral problems (e.g., violence, incivility) that have a negative impact on work organization.

Irrespective of the choice of segmentation criteria, segmentation into categories is limited by granularity and temporality. Personalization of all service dimensions at all times is not achievable. Many consumers today personalize a T-shirt or other personal items using a slogan or color scheme but the company continues to mass-produce the basic T-shirt or item while varying its slogan or color to suit the individual buyer. Moreover, even if new IT systems offer a means toward a much higher level of customization in the future, a half-way goal of prioritizing certain dimensions for categorization and redesign (e.g., the start and end of a care process) might be more reasonable than attempting to customize an entire process [25].

6.2. Step 2: service delivery; F2: information technology

Part one: Pines and Davis (1999), like many other authors, have highlighted the key role of IT (e.g., tablets, smartphones, platforms) in the development of mass customization to the extent that it allows much more automation than a traditional labor intensive production process [26]. Some authors even argue that the concept of mass customization only arose once companies had successfully integrated a series of IT and process flexibility technologies [27].

Part two: To date, the healthcare sector has witnessed integration of few such technologies, which remains a field where expectations rather than achievements are high [28]. In healthcare, IT might bring about:

- (i) Greater choice: [25] The Internet facilitates customer involvement in service delivery from the design to distribution stage [19]. For example, now-a-days it is possible in some hospitals for patients to consult a personal online portal (often called "my hospital") which

offers guidance on health professional availability. Patients can self-manage their medical appointments, medications, and other inquiries to make their care pathway more convenient for themselves

- (ii) Closer and faster interactivity: IT enables speedy interaction between customers and companies and prompt supply of customized products [29,30]. Many aspects of care delivery could benefit from closer and faster interactivity resulting in better sharing of information between patients and health professionals (e.g., the Electronic Health Record or telesurveillance system) and easier access [31].
- (iii) Greater recall: Companies use IT to recall a customer's previous queries ("memory effect") and to make customized offers (books) [32]. Patients might feel at ease during hospital admission by receiving a welcome leaflet or brochure providing details of their personal healthcare plan [33]. Such recall of details would also assist caregivers in their task of ensuring traceability of information and in their quality improvement initiatives of following up clinical criteria [34].

6.3. Step 2: service delivery; F3: developing service skills

Part one: Forza and Salvador (2006) argued thata person's attitude can determine the feasibility of customization [35] hence, why frontline workers (workers in contact with customers) have been the focus of research in services marketing [36,25].

Part two: On transferring this notion to healthcare, we find that customization would require the following human skills:

- (i) Competency both in the front office when in contact with patients and their family, and in the back office when involved in a work organization. [37] For Langley and Beasley (2007, p.20), "customization should be at the discretion of the individual provider (with the ability of course to share the customization ideas with others)" [38]. An illustration is how frontline health professionals often use their expertise and experience to bend the rules when dealing with patients resistant to standardization.
- (ii) Greater coordination skills to better adapt work organization for individual tracks. For example, the implementation of patient navigator programs has proven to be successful in enhancing quality of care and containment of costs [39].
- (iii) Greater vigilance to prevent the risk of undesirable events. In the airline industry in which, customer safety is the most important, staff members use self-observation by mirrors, cameras [40], or checklists (that have been applied in the operating rooms context) to improve vigilance.

Healthcare professionals are often poorly prepared when it comes to service skills. Judson et al. recently pointed out that medicine nowadays still retains an "asymmetry of power" likely to skew every exchange between physicians and patients [4]. To fill this gap, they advocated a variety of tools for prodding patients to ask questions

(teach-back method that urges patients to summarize what they have heard). White and Denis [41] have suggested that physicians and patients should look at the computer screen together in the examination room so that the use of computers would no longer be an issue. The learning of service skills by healthcare professionals is an important factor in implementing customization of care.

6.4. Step 2: service delivery; F4: improving patient self-management

Part one: In the services sector, customization depends upon a customer's willingness to contribute their knowledge, skills and abilities to co-produce the service experiences they want and expect [42]. Development of a self-management attitude in the service beneficiary is often associated with the notion of customer empowerment. The underlying hypothesis is that better self-management will induce more active integration in the service/production process, improve product development, and reduce costs and risks [43]. The service beneficiary is not only a person to be satisfied but also a "production" factor fulfilling tasks that in a mass-production system are done internally [44]. However, client empowerment also means that companies have to develop a fundamental capability to support "customers in identifying their own solutions while minimizing complexity and the burden of choice" [45]. This is why customer empowerment is often related to the development of service skills [46].

Part 2: In healthcare, a legal framework already stipulates that patients have to play a vital role in the management of their own healthcare. Shared decision-making between patients and physicians is already a key feature in the development of personalized medicine, especially in regards to treatments with potentially undesirable side effects. However, such self-management is encouraged more by a desire to improve quality of care and transparency than by a will to transfer tasks to the patient.

Following in the footsteps of customization in service industries would mean extending patient participation to beyond decision-making for treatments to self-management actions (planning appointments and using IT) [47]. The first step toward participation would be to include the patient in the design stage of the process (by analogy with the simple configuration of a computer from a set of pre-defined options as is the case at Dell). The second step would be to include the patient in the process itself but this would require an IT system that could handle the intensity and complexity of the patient-health professional interaction efficiently [48].

6.5. Step 3: assessment; F5: accounting for patients' experiences

Part one: By asking customers for their opinions, it is possible to assess whether a product/service meets their needs, provides high satisfaction, and encourages involvement in production [49]. Soliciting feedback can lead to expected needs and promote adjustments in work organization that will facilitate the best service delivery [50]. Moreover, an assessment based on customer feedback will

identify the product/service attributes in which customer needs deviate the most and thus will help to define what will and what will not be offered (the solution space) [45]. Customer feedback is also used to enhance the attraction of services, define priorities and evaluate the impact of corrective actions. In addition, IT provides a highly personalized channel of communication for customer feedback, which is extensively illustrated by the numerous dedicated online portals hosting customer reviews (e.g., travelers' reviews; these have transfigured the hotel industry) [51].

Part two: In healthcare, satisfaction and experience surveys are widely used assessment tools, but there is still little use of online portals. Recent innovations in online portals are patient-carer discussions on mutual needs and blogs and forums on hospital websites. A patient's assessment of a service can be expected to depend strongly on the promptness of the response [16].

6.6. Step 4: assessment; F6: economic impact

Part one: It may seem that a more personalized service incurs additional costs arising from the interaction with the service beneficiary. These costs include investment in IT equipment, customer service centers, and in the recruitment of qualified staff to handle the complexities of customization and avoid customer dissatisfaction, as well as the costs arising from a loss in economies of scale with respect to mass production. All of these aspects depend on the extent of customization in a normal mass production market [52,17].

Part two: Three facets of customization could offset extra costs in healthcare:

- (i) Enhancement of appealing services through quality improvement: This was the justification for the development of mass customization in retail and other industries in the 80s and customized mass distribution in services marketing in the 90s, which enhanced appealing services and customer loyalty. Additionally, the use of IT can reinforce the positive perception of the quality of the service but the added appeal of a customized service could lead to the charge of premiums [26]. Current healthcare regulations, especially in European countries, forbid hospitals from promoting the medical aspects of their services. In the United States, which has a more liberal system, appealing services were not found to have a positive impact on patient recruitment. As suggested by some authors this may be due to the fact that information on the quality of a service – on which captivating strategies are based – is less likely to influence consumer choice when it is publicly reported rather than when it is shared between people or by previous experiences [53]. Nevertheless, attractiveness may yet still become a strong incentive to personalize service through mass customization as budgets become tighter and as service marketing theories and techniques are transferred to healthcare [54]. Inclusion of the patient in the service production process can provide more precise, so-called sticky information on patients' needs [55], and direct interaction with individual patients, which

ultimately, as advocated elsewhere, can increase patient loyalty [17].

- (ii) Cost savings from suspending unnecessary actions: The costs saved by such strategy in the apparel industry have been estimated at nearly 30% [17]. In healthcare, early identification of the most appropriate treatment for a given patient has proven to be efficient in the long term [56], and personalized follow-up (e.g., patient navigation programs) has increased the rate of early detection of disease and reduced unnecessary treatments [57,58]. According to Gawande's hotspots mapping technique, the greatest need for a personalized service is felt by the costliest patients [24]. Customization might thus help reduce costs for patients resistant to standardization (homeless people admitted to hospital to solve a housing problem).
- (iii) Economies of scope: the focused factory model [59] (based on the hypothesis that once a customer has logged onto a supplier, the company can extend its revenue-generated offerings at a comparatively low cost) [60], is at the root of the idea of offering specialized services to large patient populations (e.g., implementing a single specific care process in breast cancer patients).

7. An integrative framework

Although the six key factors described above are distinct, they are interrelated components of our integrative framework (Fig. 1). In this integrative view, it is important to point out that the capability of patients and relatives to participate in self-management depends on two-way IT use. Actions that are taken by patients call for a response (information and coordination) from healthcare managers. On the other hand, managers request information from patients in order to identify their needs and provide a specific service. In each of these cases, IT is required for handling the information flows and transaction costs associated with mass customization. Factors related to work organization, IT and service skills depend on the way patients are categorized, for example, the "worst patients" in Gawande's scenario. Finally, the level of care customization that can be attained is secondary to financial criteria (business model), which governs the viability of any attempt at care customization.

7.1. Which strategies can promote implementation of our framework for care customization?

The effective implementation of our framework depends on the socio-economic context of its implementation. In the current socio-economic context, both personalized medicine and patient-centered care have been able to find a *raison d'être*, and care customization is simply a logical and natural extension of these two concepts.

The aim of personalized medicine is to tailor treatments to the individual patient primarily on the basis of genetic data. This aim could be extended to include not just therapeutic clinical appropriateness, but also organizational, social and psychological appropriateness. Such

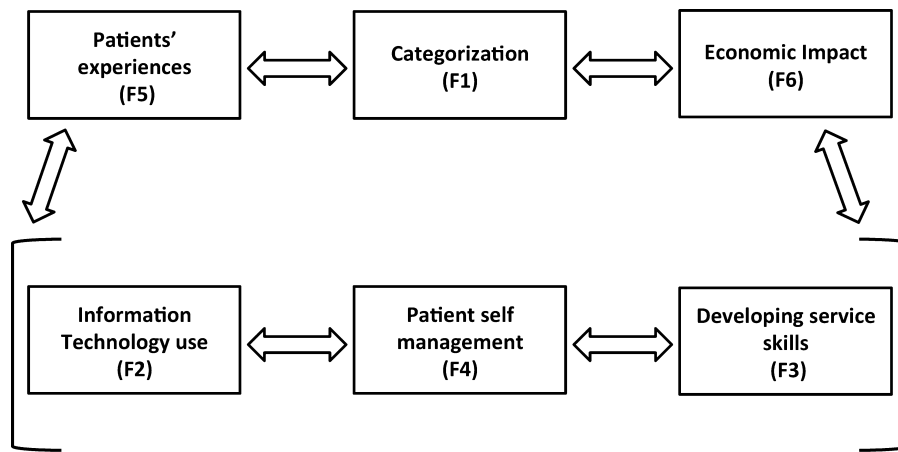


Fig. 1. Integrative framework of the 6 key factors relevant to customization of the care process. F1: Categorization; F2: Information technology use; F3: Developing service skills; F4: Patient self management; F5: Patients' experiences; F6: Economic impact.

additional considerations could help define new care paths for patients and extend the perception of care beyond the mere administration of the right drug. Care customization could then profit from the professional support already accorded to personalized medicine. Care customization also shares common features (e.g., better patient self-management) with PCC and could even be seen as a component of PCC. Care customization would be a strategy for promoting implementation of PCC as it is directly related to the process of care, whereas PCC would be a strategy for rendering the concepts of care customization operationally.

Further possible strategies for promoting care customization are encouraging patients to actively support these initiatives and to call attention to the returns on engagement that managers might gain by investing in attractive strategies (e.g., new resources and competitive advantages). However, the conditions of any investment in care customization need to be viewed with caution. According to Khota [61], the ability to transform mass customization into an actual competitive advantage depends on timing. Routine implementation of cost-compatible customization is not the same as being innovative, i.e., the first to develop customer-driven customization.

7.2. What are the limitations of our study?

The six key factors for implementation of care customization that we have identified are based on a review of the literature pertaining to a very broad field. Although articles were selected in a double-blind fashion using predefined selection criteria, we acknowledge that this literature review is not exhaustive and remains somewhat subjective. The articles were selected for review on the basis of abstract content only and may have missed factors related to mass customization mentioned in the full article. However, our literature review was nevertheless comprehensive with regard to its purpose (building the most appropriate framework for care customization in healthcare [62] and not performing an in-depth analysis of the contents of each factor). Moreover, the notions

of objectivity and value-neutrality are often untenable in forms of intellectual inquiry and knowledge acquisition as encountered when addressing personalization of care [63]. Other limitations were that we did not test factor contents and interactions in specific contexts nor study the socio-economic context of framework implementation.

7.3. What are the directions for future research?

For future research, our framework will need to be expanded and supported by empirical evidence. Its purpose is to encourage healthcare managers to reflect upon the factors needed to develop care customization, while its utility will depend on stakeholder motivation and on socio-economic context. Our hope is that the framework will be the basis of a practical tool to explore facilitators and barriers in the development of care customization processes. Ideally, it would motivate researchers to develop new theories and projects in healthcare management.

The primary *raison d'être* of customization of the care process is to provide better quality of care for patients by responding more appropriately to their individual needs. However, there needs to be a better understanding what these needs are and what the specific goals of care customization are. Should these goals concern public health policies (i.e., individual patient needs from a public health perspective) or should they concern strategic managerial goals, such as the targeting of specific patient groups for a “soft” management approach (e.g., handling antisocial behavior) or for better financial returns (e.g., enhanced promotion of services for patients that are more financially stable)?

With de-standardization increasing the norm in society, it does not come as a surprise that patients who want to be involved in decision-sharing should also want personalization of care [64]. Lampel and Mintzberg defined variants, from pure standardization to pure customization that combined and did not oppose customization and standardization. In many settings, however, the cost of pure customization might prove to be excessive. The literature on operations management often advocates

the separation of custom and standard processes, but if healthcare managers do not effectively combine them within a single structure, the result could turn out to be poor quality of care. Further research could show how different levels of standardization and personalization are actually translated into clinical practice.

8. Conclusion

This article has presented a framework to map aspects of customization relevant to the development and implementation of enhanced care delivery processes. Our framework, which integrates six key factors, was developed by considering initiatives already existing in the healthcare sector and by translating knowledge from other service sectors to healthcare.

As interest is growing in mass customization and its implementation in the health care sector, such framework could be a reference for local healthcare managers interested in developing initiatives in this area.

Conflict of interest

The authors declare that they have no competing interests.

Author's contribution

MW carried out the literature search. EM drafted the manuscript. CS and JK revised the different versions and approved the final manuscript.

Acknowledgements

The study was supported by the Foundation Philanthropia Lombard-Odier and the French National Agency for Research (ANR-MMO).

Appendix 1. General key factors (items selected in first literature review)

- Alptekinoglu A, Corbett CJ. Mass customization versus mass production: variety and price competition. *Manufacturing & Service Operations Management*. 2008; 10–2: 204–217.
- Baladron C, Aguiar JM, Carro B, Calavia L, Cadeans A, Sanchez Esquevillas A. Framework for intelligent service adaptation to user's context in next generation networks. *IEEE Communications Magazine*. 2012; 50–3: 18–25.
- Bask A, Lipponen M, Rajahonka M, Tinnila M. Framework for modularity and customization: service perspective. *Journal of Business and Industrial Marketing*. 2011; 26–5: 306–319.
- Baud-Lavigne B, Agard B, Penz B. Mutual Impacts of product standardization and supply chain design. *International Journal of Production Economics*. 2012; 135–1: 50–60.
- Bitner M, Booms B, Mohr, L. Critical service encounters: The employee's viewpoint. *Journal of Marketing*. 1994; 58: 95–106.
- Bouwens J, Abernethy MA. The consequences of customization on management accounting system design. *Accounting Organizations and Society*. 2000; 25–3: 221–241.
- Buffington J. Comparison of mass customization and generative customization in mass markets. *Industrial Management and Data Systems*. 2011; 111(1–2): 41–62.
- Brun A, Zorsini M. Evaluation of product customization strategies through modularization and postponement. *International Journal of Production Economics*. 2009; 120–1: 205–220.
- Chau PYK, Ho CKY. Developing consumer-based service brand equity via the internet: the role of personalization and triability. *Journal of Organizational Computing and Electronic Commerce*. 2008; 18–3: 197–223.
- Cavusoglu H, Cavusoglu H, Raghunatan S. Selecting a customization strategy under competition: mass customization, targeted mass customization, and product proliferation. *IEEE Transactions on Engineering Management*. 2007; 54–1: 12–28.
- Chan PYK, Ho CKY. Developing consumer-based service brand equity via internet: the role of personalization. *Journal of Organizational Computing and Electronic Commerce*. 2008; 18–3: 197–223.
- Da Cunha C, Agard B, Kusiak A. Design for cost: Module based customization. *IEEE Transactions on Automation Science and Engineering*. 2007; 4–3: 350–359.
- Davis SM. *Future Perfect*. Reading MA: Addison-Wesley. 1987.
- Dean PR, Tu YL, Xue D. A framework for generating production information for mass customization. *National Journal of Manufacture Technology*. 2008; 38(11–12): 1244–1259.
- De Bandt A, Gadrey J (eds). *Relations of Service (Markets of Service)*. Paris: Ed. CNRS, 1994.
- De Bandt A. Competitiveness and international exchanges in a service economy. *Revue d'économie industrielle (Journal of Industrial Economy)*. 1991; 55–1: 108–117.
- Des Garets V, Lamarque E, Plichon V. The business to customers relationship: from fidelity to dependence. *Revue française de gestion (French Review of Management)*. 2003; 29–144: 23–41.
- Dellaert BGC, Dabholkar PA. Increasing the attractiveness of mass customization; the role of complementary on line service and range of option. *International Journal of Electronic Commerce*. 2009; 13–3: 43–70.
- Emilia V, Daniela M, Marin P. Logistics framework in mass customization manufacturing. *Metalurgia International*. 2009; 14–3: 58–61.
- Ford RC, Dickson DR. Enhancing customer self efficacy in coproducing service experience. *Business Horizons*. 2012; 55–2: 179–188.
- Forza C, Salvador F. HRM policies for mass customization, understanding individual competence requirements and training needs for the mass customizing industrial company. *Operations Research & Management Science*. 2006; 87–1: 251–269.
- Foster M, Harris J, Jackson K, Morgan H, Glendinning C. Personalized social care for adults with disabilities: a

- problematic concept for frontline practice. *Health and Social Care in the Community*. 2006; 14–2: 125–135.
23. Fhumian M, Coe A, Kermaghan K. Transforming service to Canadians: the service Canada model. *International Review of Administrative Science*. 2007; 73–4: 557–568.
 24. Garcia Crespo A, Lopez Cuadrado JL, Colomo Palacios R, Gonzalez Carasco A, Ruiz Mescua B. A semantic based expert system to provide recommendations in the tourism domain. *Expert Systems with Application*. 2011; 38–10: 13310–13319.
 25. Gottfriedson P. Development of personalized services in small business: an iterative learning process. *Managing Service Quality*. 2010; 20–4: 338–400.
 26. Granebring A, Revay P. Service-oriented architecture is a driver for daily decision support. *Kybernetes*. 2007; 36(5–6): 622–635.
 27. Gretchen K, Managing the impersonal in a personalized public service, *Public Administration and Development*. 2003; 23–2: 197–209.
 28. Hart CWL. Mass customization, conceptual underpinnings, opportunities and limits. *International Journal of Service Industry Management*. 1995; 6–2: 36–38.
 29. Hegde VG, Kekre S, Rajiv S, Tadikamalla PR. Customization: impact on product and process performance. *Production and Operations Management*. 2005; 14–4: 388–399.
 30. Heim GR. Mass customization in videotape duplication and conversion: challenges of flexible duplication systems, fast delivery, and electronic service. *International Journal of Flexible Manufacturing Systems*. 2004; 16–4: 363–397.
 31. Ho SY, Kwok SH. The attraction of personalized service for users in mobile commerce: an empirical study. *ACM SIGecom Exchanges*. 2003; 3–4: 10–18.
 32. Hua Z. Construction of a personalized service oriented learning resource management system framework. *First International Workshop on Knowledge Discovery and Data*. 2007; 422–425.
 33. Huang JH, Shyu SHP. Building personalized relationship with customers via emails. *Total Quality Management & Business Excellence*. 2009; 20–6: 585–601.
 34. Huang XW, Kristal MM, Schroeder RG. The impact of organizational structure on mass customization capability: a contingency view. *Production and Operations Management*. 2010; 19–5: 515–530.
 35. Jiao JX, Tseng MM. Customizability analysis in design for mass customization. *Computer Aided Design*. 2004; 36–8: 745–757.
 36. Jiang K, Lee HL, Seifert RW. Satisfying customer preferences via mass customization and mass production. *IIE Transactions*. 2006; 38–1: 25–38.
 37. Julien B, Gandeul A. E-commerce, quelques éléments d'économie industrielle. *Revue économique (Economic Review)*. 2001; 52–1: 97–117.
 38. Kotha S. Mass customization-implementing the emerging paradigm for competitive advantage. *Strategic Management Journal*. 1995; 16–52: 21–42.
 39. Kristal MM, Huang XW, Schroeder RG. The effect of quality management on mass customization capability. *Production and Operations Management*. 2010; 30 (9–10): 900–922.
 40. Kumar A. From mass customization to mass personalization: a strategic transformation. *International Journal of Flexible Manufacturing Systems*. 2007; 19–4: 533–547.
 41. Kwortnik RJ, Lynn WM, Ross WT. Buyer monitoring: a means to insure personalized service. *Journal of marketing research*. 2009; 46–5: 573–583.
 42. Lampel J, Mintzberg H. Customizing customization. *Sloan management review*. 1996; 38–1: 21–30.
 43. Langley J, Beasley C. *Health Information Technology for improving quality of care in Primary Care Settings*. AHRQ Report; 2007.
 44. Lee CH, Cranage DA. Personalization-privacy paradox: The effects of personalization and privacy assurance on customer responses to travel Web sites. *Tourism Management*. 2011; 32–5: 987–994.
 45. Levitt T. Production line approach to service. *Harvard Business Review*. 1972; 4: 41–52.
 46. Mehrotra A, Damberg CL, Sorbero ME, Teleki SS. Pay for performance in the hospital setting: what is the state of the evidence. *American Journal of Medical Quality*. 2009; 24–19: 19–28.
 47. Miceli G, Ricotta C, Costabile M. Customizing customization: a conceptual framework for interactive personalization. *Journal of Interactive Marketing*. 2007; 1–2: 6–25.
 48. Nahmens I, Bindroo V. Is customization fruitful in industrialized homebuilding industry? *Journal of Construction Engineering and Management-ASCE*. 2011; 137–12: 1027–1035.
 49. Pantelidis IS, Protapapa M. Customer management and new technology: an investigation of how 5 star hotel employees perceive new technologies in the facilitation of customer retention and provision of service quality. *Information Technology and Organizations: Trends Issues Challenges and Solutions*. 2003; 1–2: 504–507
 50. Piller FT, Moeslein K, Stotko CM. Does mass customization pay? An economic approach to evaluate customer integration. *Production Planning and Control*. 2004; 15–4: 435–444.
 51. Piller FT. Mass customization: Reflections on the state of the concept. *International Journal of Flexible Manufacturing Systems*. 2004; 16–4: 313–334.
 52. Pines J, Davis S. *Mass customization, the New Frontier in Business Competition*. Boston, MA: Harvard Business Press; 1996.
 53. Reichwald R, Piller FT. From mass production toward customer integration and co production. *Wirtschaft Informatik*. 2003; 45–5: 515–519.
 54. Robinson M. Conceiving unknown situations, *Réseaux*, 1995; 13–69: 121–138.
 55. Rosenthal P, Peccei R. The social construction of clients by service agents in reformed welfare administration. *Human Relations*. 2006; 59–12: 1633–1658.
 56. Rust RT, Chung TS. Marketing models of service and relationships. *Marketing Science*. 2006; 25–6: 560–580.
 57. Selladurai RS. Mass customization in operations management: oxymoron or reality? *Omega International Journal of Management Sciences*. 2004; 32–4: 295–300.

58. Shamsuzzoha A, Kyllonen S, Helo P, “Collaborative customized product development framework”, *Industrial Management and Data Systems*, 2009; 109–5: 718–735.
59. Siddique Z, Boddu KR. A mass customization information framework for integration of customer in the configuration design of a customized product. *AIEDAM*. 2004;18–1: 71–85.
60. Squire B, Brown S, Readman J, Bessart J. The impact of mass customization on manufacturing trade-offs. *Journal of Production and Operations Management*. 2006; 15–1: 10–21.
61. Steger-Jensen K, Svensson C. Issues of mass customization and supporting IT-solutions. *Computers in Industry*. 2004; 54–1: 83–103.
62. Surprenant C, Solomon M. Predictability and personalization in the service encounter. *Journal of Marketing*. 1987; 51: 86–96.
63. Takacs B. Immersive interactive reality: Internet-based on demand VR for cultural presentation. *Virtual Reality*. 2011; 15–4: 267–278.
64. Taylor K, Conale S. Personalized service? Changing the role of the government librarian. *Journal of Information Science*. 2007; 33–3: 298–314.
65. Tenhiala A, Ketokivi M. Order Management in the customization-Responsiveness Squeeze. *Decision Sciences*. 2012; 43–1: 173–206.
66. Thoenig M, Verdier T, Jean S. Innovation défensive et concurrence internationale. *Economie et statistiques (Economy and Statistics)*. 2003; 363–1: 19–32.
67. Tian PW, Zhang YX, Zhen YZ, et al. A novel service evolution approach for active services in ubiquitous computing. *International Journal of Communication Systems*. 2009; 22: 1123–1151.
68. Tien JM. Manufacturing and services: From mass production to mass customization. *Journal of Systems Science and Systems Engineering*. 2011; 20– 2: 129–154.
69. Shin Y, An SH, Cho HH, Kim GH, Kang KI. Application of information technology for mass customization in the housing construction industry in Korea. *Automation in Construction*. 2008; 17–7: 831–838.
70. Verma R. An empirical analysis of management challenges in service factories, service shops, mass services and professional services. *International Journal of Service Industry Management*. 2000; 11–1: 8–25.
71. Wang CH. Apply robust segmentation to the service industry using kernel induced fuzzy clustering techniques. *Expert Systems with Application*. 2010; 37–2: 8395–8400.
72. Yang D, Dong M. A hybrid approach for modeling and solving product configuration problems. *Engineering Research and Applications*. 2012; 20–1: 31–42.
73. Yao JM. Supply chain scheduling optimization in mass customization based on dynamic profit preference and application case study. *Production Planning Control*. 2011; 22–7: 690–707.
74. Zimmermann A, Specht M, Lorenz A. Personalization and context management user. *Modeling and User Adapted Interaction*. 2005; 15–3: 275–302.

Appendix 2. Personalized Medicine and management issues (items selected in second literature review).

1. Bardes CL. Defining patient-centered medicine. *New England Journal of Medicine*. 2012; 366(9): 782–783.
2. Bergeson S, Dean J. A systems approach to patient centered care. *JAMA*. 2006; 296–23: 2848–2851.
3. Berwick D. What patient centered care should mean, confession of an extremist. *Health Affairs*. 2009; 24–8: 555–565.
4. Casalino LP, Devers KJ, Brewster LR. Focused factories? Physicians-owned specialty facilities. *Health Affairs*. 2003; 22–6: 56–67.
5. Curwin K, Page CJ, Sutclif S. The Terry Fox Institute Dialog: how will personalized medicine change health-care. *Current Oncology*. 2011; 18–1: 23–30.
6. De Koning P, Kevins J. Clinical pharmacology, Biomarkers and personalized medicine: education please. *Biomarkers in Medicine*. 2009; 3–6: 685–700.
7. Downing G, Boyle S, Brinner K, Osserhoff J. Information management to enable personalized medicine, stakeholders roles in building clinical decision support. *BMC Medical Informatics and Decision Making*. 2004; 9(44): 1–11.
8. Elkin E, Shapiro E, Snow J, Zauber A, Krauskopf M. The economic impact of a patient navigator program to increase screening colonoscopy. *Cancer*. 2012; 118(23): 5982–8.
9. Fierz W. Challenge of personalized healthcare: To what extent is medicine already individualized and what are the future trends. *Medicine Science Monitor*. 2004; 10(5): 111– 123.
10. Gawande A. The Hot Spotters: Can we lower medical costs by giving the neediest patients better care? *The Newyorker*. January 24, 2011.
11. Lebwohl B, Neugut AI, Stavsky E, et al. Effect of patient navigator program on the volume and quality of colonoscopy. *Journal of Clinical Gastroenterology*. 2011; 45(5): 47–53.
12. Lee HJ, Park SH, Jeong BS. An XML-based framework for personalized health management. *Studies in Health Technology and Informatics*. 2006; 122: 889–890.
13. Orfali K. Parental role in medical decision-making: fact or fiction? A comparative study of ethical dilemmas in French and American neonatal intensive care units. *Social Science & Medicine*. 2004; 58(10): 2009–2022.
14. Owens J, Cribb A. Conflict in medical co-production: can a stratified conception of health help? *Journal of Health Philosophy and Policy*. 2012; 20:3, 268–280.
15. Pfaff H, Driller E, Ernstmann N, et al. Standardization and individualization in care for the elderly: proactive behavior through individualized standardization. *Open Aging Journal*. 2010; 4: 51–57.
16. Rosenthal E. How Harold Freeman Navigated the system to take patient navigation from concept to standard care. *Oncology Times*. 2011; 34–5:21–22.
17. Rittenhouse D, Casalino L, Shortell S, et al. Small and medium size physician practices use few patient-centered medical home processes. *Health Affairs*. 2011; 30–8: 1575–1584.

18. Simmons LA, Dinan MA, Robinson TJ, Suyderman R. Personalized medicine is more than genomic medicine: confusion over terminology impedes progress toward personalized healthcare. *Personalized Medicine*. 2012; 9–1: 85–91.
19. Steventon A, Dixon J, Doll H, et al. Effect of telehealth on use of secondary care and mortality: findings from the whole system demonstrator cluster randomized trial. *British Medical Journal*. 2012; 344 e3874: 1–15.
20. Yaya S, Raffellini C. Technological transformations and evolution of the medical practice: current status, issues and perspectives for the development of telemedicine. *Revue Medicale de Bruxelles (Medical review of Bruxelles)*. 2009; 30–1: 83–91.

References

- [1] Dishman, E. Healthcare should be a team sport 2013, TED website. www.ted.com/eric_dishman/health_care_should_be_a_team_sport [accessed 15.09.13].
- [2] Barnes K, Levy D, Lutz S. Customizing healthcare: how a new approach to diagnosis, care, and cure could transform employer benefits in a postreform world, 13. Pwc University; 2013. p. 1–4. <http://www.pwc.com/us/en/view/issue-13/customizing-healthcare.jhtml> [accessed 15.09.13].
- [3] Davis SM. Future perfect. Reading, MA: Addison-Wesley; 1987.
- [4] Judson TJ, Detsky AS, Press MJ. Encouraging patients to ask questions: how to overcome white-coat silence. *Journal of the American Medical Association* 2013;309(22):2325–6.
- [5] Kicken, W, Van der Klink, M, Barach, P, Boshuizen, HPA. Handover training: does one size fit all? The merits of mass customization. *BMJ Quality & Safety Online First*, published on 30 October 2012 as 10.1136/bmjqs-2012-001164 [accessed 15.09.13].
- [6] Laksman Z, Detsky A. Personalized medicine: understanding probabilities and managing expectation. *Journal of General Internal Medicine* 2010;26(2):204–6.
- [7] Nicholson JK, Holmes E, Kinross JM, Darzi AW, Takats Z, Lindon JC. Metabolic phenotyping in clinical and surgical environments. *Nature* 2012;491(7424):384–92.
- [8] Hamburg MA, Collins FS. The path to personalized medicine. *New England Journal of Medicine* 2010;363:301–4.
- [9] Fierz W. Challenge of personalized healthcare: to what extend is medicine already individualized and what are the future trend? *Medical Science Monitor* 2004;10(5):111–23.
- [10] Barry MJ, Edgman-Levitan S. Shared decision making – the pinnacle of patient-centered care. *New England Journal of Medicine* 2012;366:780–1.
- [11] Bardsley CL. Defining patient-centered medicine. *New England Journal of Medicine* 2012;366(9):782–3.
- [12] Berwick D. What patient-centered should mean: confession of an extremist. *Health Affairs* 2009;28(2):555–65.
- [13] Bergeson S, Dean JA. Systems approach to patient centered care. *Journal of the American Medical Association* 2006;296(23):2848–51.
- [14] Toffler A. Future shock. London: Bantam; 1970.
- [15] Pine BJ. Mass customization. Boston, MA: Harvard Business Press; 1993.
- [16] Da Silveira G, Borenstein D, Fogliatto FS. Mass customization: literature review and research directions. *International Journal of Production Economics* 2001;72(1):15–25.
- [17] Piller FT, Moeslin K, Stotko CM. Does mass customization pay? An economic approach to evaluate customer integration. *Production Planning and Control* 2004;15(4):435–44.
- [18] Pine J, Victor B, Boyton A. Making mass customization work. *Harvard Business Review* 1993;30(3):171–4.
- [19] Lampel J, Mintzberg H. Customizing customization. *Sloan Management Review* 1996;38(1):21–30.
- [20] Hart C. Doing a literature search: a comprehensive guide for the social sciences. London: Sage; 2010.
- [21] Des Garets V, Lamarque E, Plichon V. The business to customers relationship: from fidelity to dependence. *Revue française de gestion (French Management Review)* 2003;29(144):23–41.
- [22] Brown S. Customer relationship management: a strategic imperative in the world of ebusiness. Ontario, Canada: John Wiley and sons; 2000.
- [23] Fierz W. Challenge of personalize healthcare. *Medical Science Monitor* 2004;10(5):111–23.
- [24] Gawande A. The Hot Spotters: can we lower medical costs by giving the neediest patients better care? *The New Yorker* 2011 [January 24].
- [25] Surprenant C, Solomon M. Predictability and personalization in the service encounter. *Journal of Marketing* 1987;51:86–96.
- [26] Pines J, Davis S. Mass customization the new frontier in business competition. Boston, MA: Harvard Business Press; 1996.
- [27] Khota S. Mass customization: a strategy for knowledge creation and organizational learning. *International Journal of Technology Management* 1996;11(7):846–58.
- [28] Topol E. The creative destruction of medicine: how the digital revolution will create better healthcare. Basic Books; 2012.
- [29] Frutos JD, Borenstein D. A framework to support customer–company interaction in mass customization environments. *Computers & Industrial Engineering* 2004;54:115–35.
- [30] Huang JH, Shyu SHP. Building personalized relationship with customers via emails. *Total Quality Management & Business Excellence* 2009;20(6):585–601.
- [31] Steventon A, Bardsley M, Billings J, Dixon J, Doll H, Hirani S, et al. Effect of telehealth on use of secondary care and mortality: findings from the whole system demonstrator cluster randomized trial. *British Medical Journal* 2012;344, e3874: 1–15.
- [32] Ho SY, Kwok SH. The attraction of personalized service for users in mobile commerce: an empirical study. *ACM SIGecom Exchanges* 2003;3(4):10–8.
- [33] Rosenthal E. How Harold Freeman Navigated the system to take patient navigation from concept to standard care. *Oncology Times* 2011;34(5):21–2.
- [34] Downing G, Boyle S, Brinner K, Ossehoff J. Information management to enable personalized medicine: stakeholders roles in building clinical decision support. *BMC Medical Informatics and Decision Making* 2004;9(44):1–11.
- [35] Forza C, Salvador F. HRM policies for mass customization: understanding individual competence requirements and training needs for the mass customizing industrial company. *Operations Research & Management Science* 2006;87(1):251–69.
- [36] Bitner M, Booms B, Mohr L. Critical service encounters: the employee's viewpoint. *Journal of Marketing* 1994;58:95–106.
- [37] Kimberly J, Minvielle E. Quality in healthcare as an organizational problem. In: Mick S, etWytenbach M, editors. *Advances in healthcare organization theory*. San Francisco: Jossey-Bass Publishers; 2003. p. 205–33.
- [38] Langley J, Beasley C. Health information technology for improving quality of care in primary care settings. *AHRQ*; 2007.
- [39] Elkin E, Shapiro E, Snow J, Zauber A, Krauskopf M. The economic impact of a patient navigator program to increase screening colonoscopy. *Cancer* 2012;118(23):5982–8.
- [40] Levitt T. Production line approach to service. *Harvard Business Review* 1972;4:41–52.
- [41] White A, Danis M. Enhancing patient-centered communication and collaboration by using the electronic health record in the examination room. *Journal of the American Medical Association* 2013;309(22):2327–8.
- [42] Ford RC, Dickson DR. Enhancing customer self efficacy in coproducing service experience. *Business Horizons* 2012;55(2):179–88.
- [43] Fuchs C, Schreiber M. Customer empowerment in New product development. *Journal of Product Innovation Management* 2011;28(1):17–32.
- [44] Ramirez R. Value co-production: intellectual origins and implication for practice and research. *Strategic Management Journal* 1999;20:49–65.
- [45] Salvador F, De Holan PM, Piller F. Cracking the code for mass customization. *Sloan Management Review* 2009;50(3):71–8.
- [46] Lashley K. Empowerment. HR strategies for service excellence. Amsterdam: Elsevier; 2001.
- [47] Amar L, Minvielle E. Public action for the user: the institutional dynamics of the daily working practices. The case of the obligation to inform the patient. *Sociologie du travail (Sociology of Work)* 2000;1(42):69–89.
- [48] Lee CH, Barua A, Whinston A. The complementarity of mass customization and electronic commerce. *Economics of Innovation and New Technology* 2000;9(2):81–110.
- [49] Lee CH, Cranage DA. Personalisation-privacy paradox: the effects of personalization and privacy assurance on customer responses to travel Web sites. *Tourism Management* 2011;32(5):987–94.
- [50] Ahlstrom P, Westbrook R. Implications of mass customization for operations management: an exploratory survey. *International Journal of Operations and Production Management* 1999;19(3):262–74.

- [51] Garcia Crespo A, Lopez Cuadrado JL, ColomoPalazios R, Gonzalez Carasco A, Ruiz Mescua B. A semantic based expert system to provide recommendations in the tourism domain. *Expert Systems with Application* 2011;38(10):13310–9.
- [52] Zipkin P. The limits of mass customization. *Sloan Management Review* 2001;42(3):81–7.
- [53] Hibbard JH, Stockard J, Tusler M. Hospital performance reports: impact on quality, market share, and reputation. *Health Affairs* 2005;24(4):1150–60.
- [54] Stremersch S. Health and marketing. The emergence of a new field of research. *International Journal of Research in Marketing* 2008;25(4):229–33.
- [55] Von Hippel E. Sticky information and the locus of problem solving. *Management Science* 1994;40(4):429–39.
- [56] Curwin K, Page CJ, Sutclif S. The Terry Fox institute dialogue: how will personalized medicine change healthcare. *Current Oncology* 2011;18(1):33–8.
- [57] Rosenthal E. How Harold Freeman Navigated the system to take patient navigation from concept to standard care? *Oncology Times* 2011;34(5):21–2.
- [58] Lebwohl B, Neugut Al Stavsky E, et al. Effect of patient navigator program on the volume and quality of colonoscopy. *Journal for Clinical Gastroenterology* 2011;45(5):47–53.
- [59] Casalino L, Devers K, Brewster L. Focused factories? Physician-owned specialty facilities. *Health Affairs* 2003;22(6):56–67.
- [60] Pine BJ, Peppers D, Rogers M. Do you want to keep your customers forever? *Harvard Business Review* 1995;73(2):103–4.
- [61] Khota S. Mass customization: implementing the emerging paradigm for competitive advantage. *Strategic Management Journal* 1995;16:21–42.
- [62] Stark D. *The sense of dissonance. Accounts of worth in economic life.* Princeton, NJ: Princeton University Press; 2009; *Methodology of qualitative research. Ten questions of the comprehensive approach.* Vuibert, 227 p; 2010.
- [63] Habermas J. *Justification and application.* Cambridge, MA: MIT Press; 1993.
- [64] Pfaff H, Driller E, Ernstmann N, Karbach U, Kowalski C, Sheibler F, et al. Standardization and individualization in care for the elderly: proactive behavior through individualized standardization. *Open Longevity Science* 2010;4:51–7.