CORVINUS UNIVERSITY of BUDAPEST

LEAN TRANSFORMATION OF HOSPITAL PROCESSES

Structuring foreign and Hungarian experiences

Ph.D. dissertation

István Jenei

Budapest, 2009

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Lean transformation of hospital processes
Structuring foreign and Hungarian experiences

Department of Logistics and Supply Chain Management

Supervisor: Krisztina Demeter, Ph.D.

Corvinus University of Budapest

Doctoral School in Business Administration

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Introduction

98 thousand lives are claimed in the USA and 3-6 thousand in Hungary by fatal medical errors in hospitals. The main challenges faced by health care systems in general and the hospitals of the most advanced countries in particular are their over-complicated, wasteful, unorganised processes; poor communication; frustrated staff and patients; an error rate approximating 10% and growing care provision costs (Konh – Corrigan, 2000; Varga et al., 2005; Spear, 2005; National Audit Office, 2005; Schenk, 2006; Burgess et al., 2009; NHSIII, 2007). Lean, and the lean transformation of hospital processes, on the other hand, offers the perspective of quality improvement and organised processes; shorter waiting times and less frustration; more time for the patient and harnessed expenditure growth (Spear, 2005). Therefore, Lean is considered an excellent development option for health care in general and hospital processes in particular. In line with that, it has been the subject of increasingly intensive interest since the 2000s (Brandao de Souza, 2009), and it actually represents the basis of the latest series of efficiency-enhancement programmes of NHS, the British National Health Service (Proudlove et al., 2008).

We do not know exactly when and where the lean transformation of hospitals started. It is not clear either how many hospitals/institutions apply the system or its tools now. Mark Graban's (2009) recently released book puts the number of institutions where the process had already started to several hundreds. Powell (2009) says, with reference to Doug Dulin, Director of the consulting firm "Lean Six Sigma for International Capital and Management", that around 10% of hospitals in the US apply the lean and the six sigma methodology.

According to a British survey carried out in 2008 in the hospitals of the National Health Service, Lean was present in the annual reports for 2007/08 of 80 of the 152 registered hospitals (53%!) (Burgess et al., 2009), although at most places it was in an initial stage only. In 2005, few at NHS had occupied themselves with Lean as yet: "*...no one before 2005 in the NHS had tried to apply lean principles across a hospital as a whole. Indeed by 2005 there were only a few hospitals world-wide who were attempting*

this such as Virginia Mason in Seattle, Flinders in Adelaide and ThedaCare in Wisconsin." (Fillingham, 2007, p.233.).

Probably the two most prominent examples of lean transformation are Virginia Mason Medical Center in Seattle, USA, a private hospital which started to transform its operation on the initiative of the upper management (Spear, 2005), and a British NHS[1] hospital in Bolton. According to the technical literature, the national health service of the United Kingdom has made the most progress globally in the systematic introduction of lean principles (Productive Ward, Productive Operation Theater programmes). Their programme is in charge of a special professional authority, formerly called the NHS Modernization Agency, now the NHS Institute for Innovation and Improvement – NHSII). The NHSII staff have no doubt learned a lot from the lessons of lean initiatives co-ordinated by the Institute for Healthcare Improvement (IHI) in the US. (Proudlove et al., 2008)

Encouraged by former British National Health Service Modernisation Agency Director David Fillingham, and with the assistance of Daniel T. Jones, renowned researcher and professional of Lean, several British hospitals have carried out project-like developments. The projects, although quite successful, have not led to the comprehensive, full, implementation of lean philosophy in hospital operation overall. In the UK, Royal Bolton Hospital was the first institution which, under the leadership of Hospital Director David Fillingham, embarked on the path of systemic lean transformation in 2005. (Fillingham, 2007)

Since the release of the first publications on the lean transformation of health care institutions and in particular hospitals, the following questions have been asked by many researchers and experts:

What are the experiences of the managers, employees and researchers in regard of the application of Lean? What are the potential outcomes and the typical difficulties of such initiatives?

[1] National Health Service - NHS

Since neither the international, nor the Hungarian technical literature provides a systematic and comprehensive overview of such experiences (Brandao de Souza, 2009), I decided to stop that gap and I chose as the topic of my dissertation the accomplishment of this task.

Over and beyond the theoretical and practical relevance of answering the above questions, I have my personal motives as well. My first degree is in engineering, and my first work experiences were in production planning and everyday production management at production companies. In 2000, when I moved to a new job, I was sent to a 4-month practical training course where I got acquainted with the theoretical bases and practice of lean management. From that time on, my professional career has been linked with this management system.

I finished my post-graduate studies at the Faculty of Business Administration of Budapest University of Economic Sciences and Public Administration[2] with a thesis on that topic (Jenei 2001) and, subsequently, when I joined the Department of Business Administration of the University[3], it became my main area of research. My thesis submitted in 2001 was written with the objective to provide a comprehensive overview in Hungarian of the emergence, value system, main tools of the lean management system.

During my years of research at the University, I took part in several research projects as a member of small professional teams which focused on the examination of the lean transformation of production companies (Losonci et al., 2007; Demeter et al., 2007; Jenei – Losonci, 2007). A major factor of the shift of the focus of my interest from industrial production to public services was the research project carried out at the request of the National Police (ORFK) in 2004-05 to upgrade the police operation processes (Chikán et al., 2005). I was introduced to the application of Lean to non-profit organisations in connection with the improvement of the administrative processes of a professional organisation (Jenei et al., 2007). I chose health care from among the service systems of the public sector because the financing, quality and efficiency of

[2] This corresponds to the current Faculty of Business Administration of Corvinus University, Budapest.
[3] To date: Institute of Business Economics

health care has been a topical issue in recent years in Hungary, and because this is an important issue internationally as well.

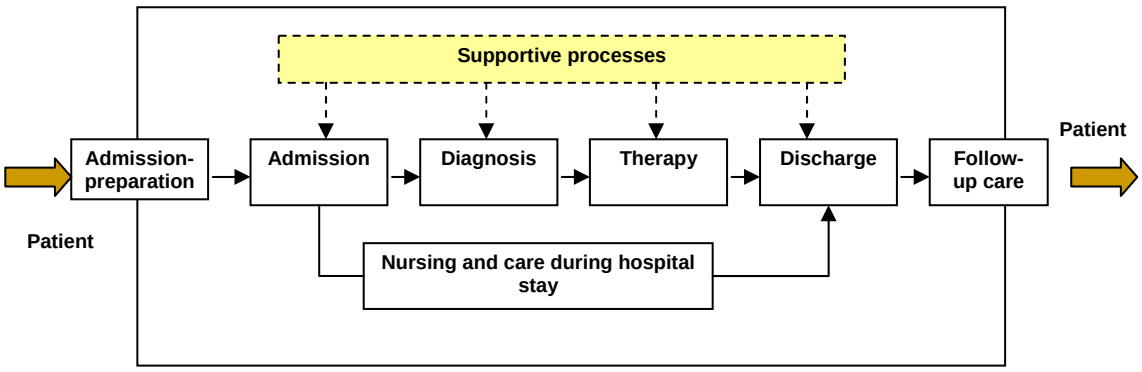
The background of the research is provided by the area, information base and notions of operations management (OM). Within that, the two major issues concerned are the management of the health care service processes (i.e. health operations management), and the concept of lean management. To ensure the correct interpretation of the statements of the dissertation, it is imperative to define its basic concepts, i.e. **hospital processes, quality, efficiency and lean management.** This is what I shall do first.

Donabedian suggests that, in general terms, the process of health care provision "*…is the highly complex system of interactions and activities created between the doctor and the patient, and any other activity within the limits of the operation of the health care organisation"* (Gődény, 2007, p.200.). Since the dissertation treats **hospital processes,** by "health care organisation" as defined by Donabedian I mean the hospitals. This definition is interpreted and specified by Ebner – Köck (1999) who, on the basis of the distinction present also in the definition, speak of main- and supportive processes. The first contribute directly to value creation, that is, the patients take part in them directly, while supportive processes enable the operation of the main processes, such as laboratory tests, laundry service, pharmacy service, sterilisation, maintenance, cleaning etc. (Figure 1).

Quality is another key concept of the dissertation. Despite several attempts to define it**,** it has had no commonly accepted definition to this day. The dissertation starts out from the definition of quality by one of the most renowned professionals of the field. According to Feigenbaum (1983); **quality** "*Is the totality of the market, design, manufacturing and maintenance characteristics of the product and the service, through which the latter meet the expectations of the consumer*" (quoted in Gődény, 2007, p.130.). The common interpretation of quality in the health care management literature is more complex, however basically matches this definition. Donabedian identifies three components of quality within health care service. (1) The **outcome** (e.g. state-of-health, attained quality, mortality etc.), the (infra)**structure** (buildings, equipment, personnel,

experience etc.) and the several features of processes (e.g. adequacy, efficiency, effectiveness etc.) (Belicza – Zékány, 1998). Donabedian explains this approach as follows: "*Good structure is likely to enhance the probability of good processes which, in turn, enhance the probability of good results."* (Donabedian, 1988 , quoted in: Gődény, 2007, p.199.).

Figure 1: Main and supportive processes in heath care



Source: Ebner – Köck, 1999, p.94.

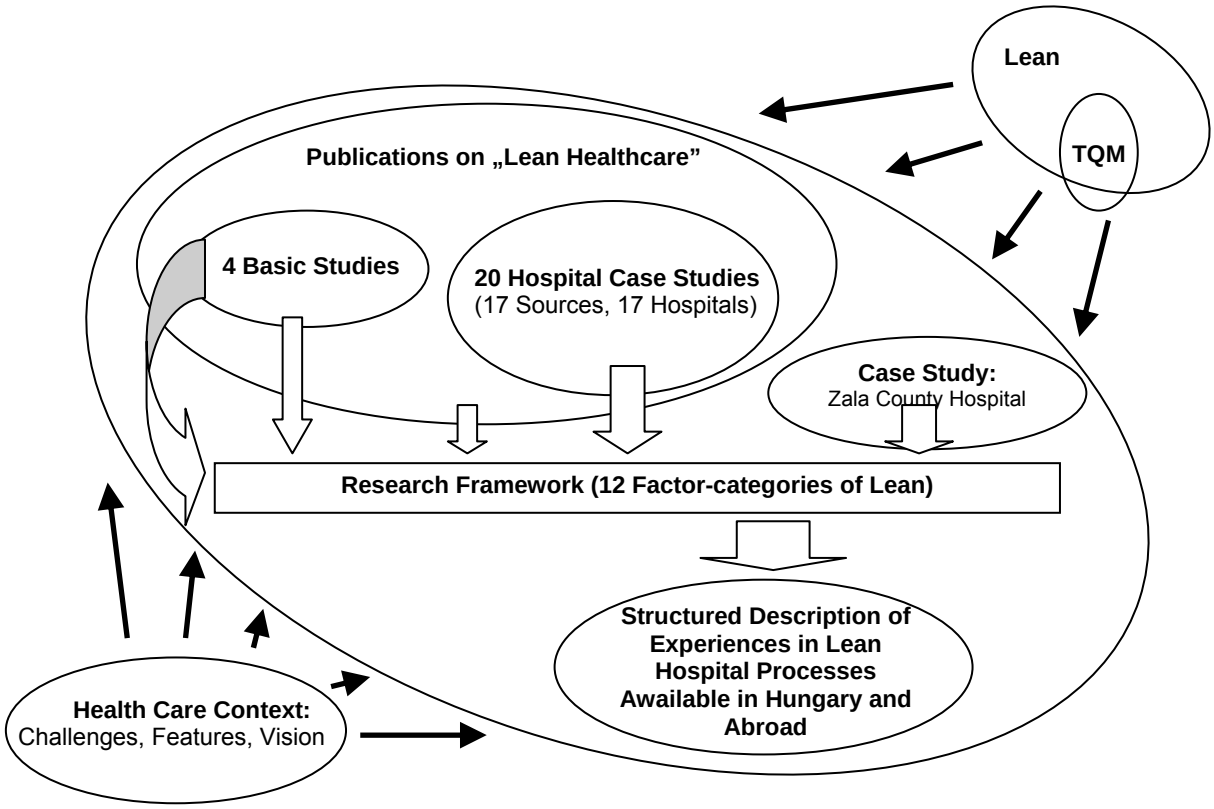
That is, according to the general interpretation of quality in health care, both the **outcome** (e.g. state-of-health of the patient) and the **efficiency** of the care service process are part of it**.** Efficiency being a key topic of the dissertation, let me quote one of its definitions here: "*Economics says efficient use of the resources at your disposal means you produce the highest return through the consumption of the products and services produced with their help"* (Evetovics-Gaál, 2005, p.29.). Efficiency, however, manifests itself in several forms: **allocation efficiency** informs you whether you produce what the customer values highest. **Production efficiency**, on the other hand, indicates the amount of resources allocated to the production of a given service/product (Evetovics-Gaál, 2005). Since the latter concept, i.e. production efficiency, is closer to the essence of the dissertation, i.e. process investigation, in what follows, I shall use the term "efficiency" in that sense.

The content of **lean management** will be discussed in detail below; suffice it to quote here its definition used also by me: *"Lean production is an integrated socio-*

technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer, and internal variability" (Shah - Ward, 2007, p.791.).

The logic of the dissertation and the interrelationship of the individual chapters are shown in Figure 2.

Figure 2: Topics of the dissertation and their interrelationships



Source: Figure made by the Author.

The fields in the upper right and bottom left corners of the figure represent the context of the research, presented in Chapters 1 and 2 of the study. These are the following:

- Lean management, which has become best practice in the mass production of motorcars and electronic products by now (Lewis, 2000; Karlsson. – Ahlstrom, 1996). Chapter 1 gives a brief description of the origin of Lean; the development of the Toyota Production System (TPS) and the current interpretation of lean management. Whether TQM is part of Lean or a system on its own is a topic of dispute even among experts. Chapter 1 interprets this relationship as well, which will be relevant in the discussion of the case of Zala County Hospital. The chapter ends with the vision of lean health care outlined by Womack – Jones.
- Chapter 2 tackles another issue of relevance for the research: the distinctive characteristics of health care as opposed to production. Then it shows the main challenges faced by the system and its institutions through the example of the health care provision systems of some advanced countries.

These two major factor groups indicate the frame of reference of the research; they mark out its limits and options. This is symbolically represented in the figure by the biggest ellipse and the arrows starting from the two factor groups.

Chapter 3.1. explains the research question in detail, and also the considerations regarding the research methodology. The backbone of the methodology, which was adjusted to the research question, was provided by case studies on the lean transformation of hospital processes in the international literature, and by the study of the case of a Hungarian hospital. To process this material, I had to prepare a framework of analysis, i.e. a preliminary code system. I produced the code system which was to serve as the analytical framework of my work through the open coding of four summary writings chosen from the relevant technical literature. The derivation of the research framework from the four main sources is symbolically represented in the figure by the curved arrow. The framework creating process and the framework itself is described in the remaining subchapters of Chapter 3.

To classify experience accumulated on the lean transformation of hospital processes, I then collected from the relevant (and accessible) databases the articles which described the lean efforts of hospitals and the related experiences with sufficient detail and a scientific exactitude. This produced 20 hospital case descriptions. The information provided by these cases was structured and summarised according the codification framework elaborated before. Chapter 4 introduces this work. Since these provided information based on secondary sources and there was no Hungarian case among them, to remedy the deficiencies, I carried out a case-study research at Zala County Hospital (ZMK), Hungary. The information gathered during the research was structured also according the previously elaborated framework. Chapter 5 gives a short overview of the Hungarian health care environment in which hospitals function. Chapter 6 details the case of the Zala County Hospital (ZMK).

Chapter 7 presents the results of the dissertation in detail. It contains the synthesised review of information from the four basic literature items, the 20 foreign and 1 Hungarian case studies – supplemented with the experiences of other sources related to the topic –, structured according to the analytical framework, in a systematic way.

Chapter 8 summarises the whole study, describes the practical and scientific contribution made by the author and also phrases the possible further research directions

The introductory part cannot be complete without the discussion of a highly important issue, viz. the theoretical relevance of the research. Over and beyond its practical relevance, the ideal of lean health care and the possibilities and pitfalls of its implementation is also key to scientific understanding. Hines et al. (2004), while condemning a major part of researcher society for identifying the lean principles with production, also hint at what could be the main areas of research in regard of this topic: ***"Further research is called for to see how this (introduction of value systems based on the lean philosophy) can be achieved in under-researched sectors, such as low-volume manufacturing and service contexts like health care, which are still in early stages of their lean evolution"*** (2004, p.1007.). What is proposed by Hines et al. matches the target defined as commendable by the representative organisations of the

researchers of operations management[4] (Pannirselvam et al., 1999), i.e. basically that the growth of the services sector ought to be concurrent with a corresponding growth of the number of research projects there. In reality, however, the latter figure has always been much lower than the number of research projects in the production sector (Matchuca et al., 2007). The review carried out by Smith et al. (2007) of articles published in 1990–2006 in five leading (production and services) operations management periodicals demonstrated that researcher society responded with a significant delay to this increasingly definite directive. The same tendency has demonstrably been present, even more forcefully, in the research of Lean options in health care. Radnor et al. (2006) note the small number of descriptions or assessments of Lean in the public sector. It is typical that, of the 463 articles identified by Smith et al. (2007) as a being related to the services (based on their title), only 35 actually treated a health care issue of some kind, and none referred to research on the application of lean principles there.

In discussing the lean approach, one must not forget the many other development approaches which target patient care development at the level of the organisation. Their forms are many, e.g. objective medicine, accreditation, total quality management, risk management and error prevention, organisational development etc. These approaches are partly competing and partly complementary ones (Grol et al. (2002). Their implementation raises many open questions: *"We simply do not know which to apply and when, or what to expect"* (Grol et al, 2002, p.110.). Although this dissertation is limited to the description of the steps and effects of Lean, many of its findings are probably equally true of other development approaches and it will obviously contribute also to the clarification of the relative positions of the various alternative solutions.

[4] Production and Operations Management Society – POMS; European Operations Management Association – EurOMA

1. Description of lean management and a vision of lean health care

This chapter presents the development and content of lean management. It begins with a discussion of how the Toyota Production System has gradually moved into the centre of attention and why the system came to be called "Lean'. Then it presents the logical chain or guiding principles associated with lean thinking or lean management. It is this guideline which provided the necessary conceptual support to roll out the system applied in production to other industries and to the services, health care included. The next step is the presentation of the tools of lean management identified already by researchers. The fourth section of the chapter is devoted to the interrelationship of Lean and Total Quality Management (TQM). Finally, it quotes a vision of lean health care projected on the basis of the lean principles introduced in Section 1.2.

1.1. The origins of lean management

The bases of Lean go back to the operating practice of Toyota (Womack et al., 1990). From the 1970s on, the car factory itself as well as Japanese economy overall have moved to the centre of attention in the USA. At the time, the American automotive manufacturer triad of General Motors, Ford and Chrysler, incontestable global market leaders until then, suffered drastic market losses due to the progress of Japanese car manufacturers, considered insignificant competitors until then (Womack et al., 1990). The analysis of the circumstances provided the triad a clear view of their quite serious situation: the products of the Japanese rivals were not only cheaper, but also of higher quality and, what is more, their manufacturers managed to achieve those standards while producing significant profits. The final impetus to the recognition of the necessity of change was provided by the oil crises of 1973 and 1979. The objectives of change were obvious: product development for the sake of more efficient fuels utilisation; radical product quality improvement and, simultaneously, a drastic trimming of the

production and operating costs. Industry representatives, researchers and politicians all agreed that the solution lay in the exploration of the secrets of Japanese industry. That is how the first International Motor Vehicle Program (IMVP) came about. The researchers explored the production system responsible for the significant competitive edge of Japanese manufacturers, embodied best in Toyota Production System (TPS). The word "lean" was first used by John F. Krafcik (1988) to describe the practice at its best in TPS, in opposition to the "buffered" production system typical of Ford: "*Rather than continuing to refer to the different paradigms as recent Fordism and TPS, I would like to introduce two new terms here – buffered and lean production systems. The reasons for selecting these terms are obvious. The production systems of most Western producers throughout most of the post war period were buffered against virtually everything."* (Krafcik, 1988 p. 44.)

The findings of five years of research were summed up in a book (also) by three authors, Womack – Jones – Roos (1990). "The Machine that Changed the World" promptly hit the bestseller list, and it actually became the most frequently cited operations management source of the decade (Holweg, 2007). Following in the footsteps of Krafcik (1988), the authors labelled "lean production" what they understood and learned from TPS, and the underlying thinking came to be called "lean thinking". The word 'lean' itself refers to the typical feature and continuous effort of the system to produce more with less: "*Lean production uses half the human effort in the factory, half the manufacturing floor-space, half the investment in tools, half the engineering hours to develop a new product in half the time. It requires keeping half the inventory stock; it results in many fewer defects, and produces a greater and ever growing variety of products.*" (Womack et al., 1990, p.13)

Several companies have tried to adapt the lean production system to their own organisation, with mixed results: often, the initiators of the changes failed to achieve their goals. In the car industry and in electronics, on the other hand, lean management has no doubt become best practice (Voss, 2005). And in 2008, Toyota became No 1 global car manufacturer, thanks to its unbroken development and success (Fortune 500, 2008).

The most important events and publications related to the origin and development of Lean can be seen in Annex 10.1.

1.2. The bases of lean thinking

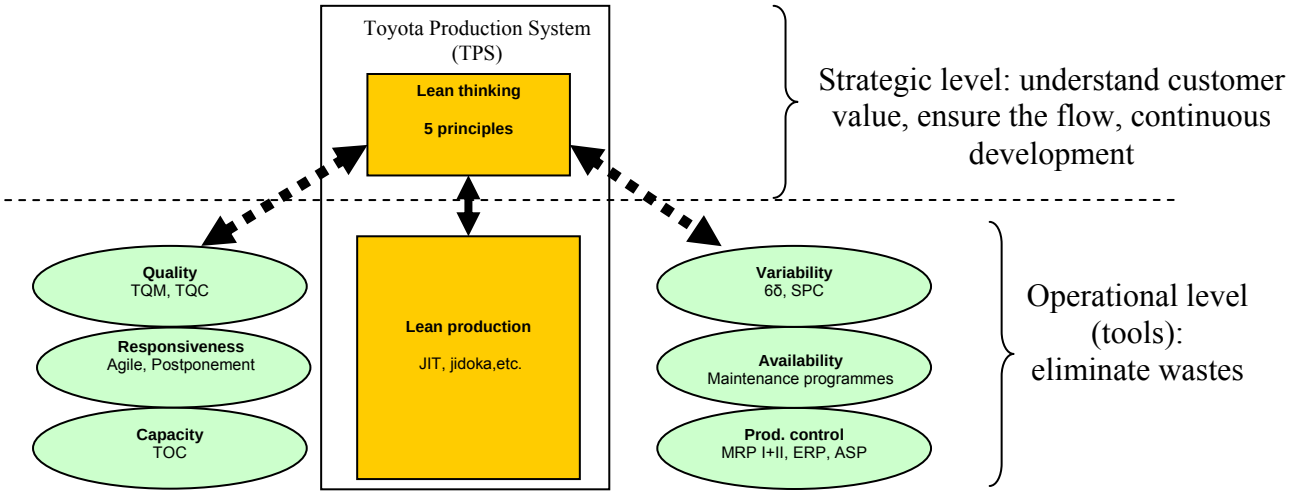
Lean production has evolved concurrently with the development of Toyota's production practice over the years. Surprisingly, the system was not recorded in writing until 1965: it could only be learned from the practice of the plants (Holweg, 2007). Its first English description was released in 1977 by Sugimori et al., followed by a series of works devoted to the components of the system. Researchers, however, sketched several variants of the system, even if they inspected the same company. Since the lean system actually denoted Toyota's continuously developing production (and management) practice, it is virtually impossible to provide a precise and up-to-date description of the system. Therefore, researchers and managers must content themselves with developing their own interpretation of lean management based on past information.

What seems to be generally agreed by the researchers is that lean management has a dual background: (i) firstly, the totality of tools, methodologies[5] observable in the production organisation/management practice of the Toyota plants (kanban, SMED, andon etc.), (ii) secondly, the philosophy and the principles which have led to the emergence and continuous development of these tools (Shah - Ward, 2003; Hines et al., 2004). The article by Hines et al. (2004) makes a clean distinction between the lean production system, meaning the application of the (operational) tools designed for the development/management of the production area, and the application of lean thinking as a strategic approach (see Figure 3).

[5] I will not give a detailed description of this tools and methodologies in this study. There are several books available on the topic; it would be even lengthy to list them. In Hungarian there are several consultant web pages, where exhaustive description can be found. Understanding can be obtained also from the glossary of the Hungarian translation of Womack – Jones' book, „Lean Thinking": James P. Womack – Daniel T. Jones (2009): Lean szemlélet, HVG Kiadó, Budapest. Of the tools important for this study I provide a short description where it supports understanding the most.

Whereas lean thinking focuses on understanding customer value and on efforts to enhance that, at operational level, the crucial issue is to master the tools and to use them appropriately. The figure clearly shows that the evolution of the lean system was concurrent in part with the adaptation of further tools (such as the 6 sigma method) which had not been part of the traditional lean production system of Toyota, as described for example by Womack et al. (1990). Whether these, too, should be regarded as lean tools is subject to dispute. The proposition, however, is logical, given the compatibility of their objectives with those of the operational tools of lean management. TQM[6] is in a special relationship with lean management, since TQM can function also as an independent system. I shall briefly discuss the TQM/Lean relationship in Section 1.4.

Figure 3: Framework structure to understand the lean



Source: Based on Hines et al. (2004)

The identification of lean thinking and its 5 core principles indicated in the figure above is associated with the names of Womack and Jones (1996). They suggested that the latter governed the development efforts of Toyota's engineers:

[6] TQM: Total Quality Management. For more detail, see the following chapter and Tenner – DeTorro (1996).

1. Define customer value: Companies aim at creating customer value, not at excellence per se. Thus product quality, functionality as well as the production processes can only be evaluated in view of the full understanding of customer needs/demand. Consequently, development must always be based on an adequate knowledge of customer demand. The objective of the system is to provide customer value and to get rid of elements that do not contribute to customer value creation.

2. Map the value stream: i.e. the stream through which the product (value) desired by the customer is created (value stream analysis). It is essential to explore every step, and to assess precisely its characteristics. The graphic representation of the stream may generate development itself by highlighting redundant steps, loops, problem areas.

3. Create flow: It is essential for lean management to ensure the continuous flow of the product must be ensured, without any breaking points. This includes the reduction of the physical distance between associated operations of the flow, and the acceleration of hand-over between the steps. Breaking points cause delay, loss of information, inventory accumulation, all of which impede flexibility and fast customer service and is thus contrary to the philosophy of the management. Breaking points may be visible or invisible partition walls between e.g. workshops, departments, work shifts, or the separation of technologies.

4. Establish pull: The pull principle means that value creation should begin if and when the relevant customer demand presents itself. Lean management exploits the flexibility of the system to adjust to customer demand. This flexibility, however, can only be ensured if the product flow is not blocked by fictitious orders, i.e. orders that are not based on concrete customer demand. Therefore, the objective of lean management is to start a process step if and only if its execution is justified by concrete customer demand.

5. Seek perfection: Efforts must be made to perfect the system; to improve it continuously. Customer needs change and, to match them, the system itself must also change continuously. On the other hand, the

> production arrangements themselves can also be improved endlessly. For a system to continuously perform at a high level, instead of being satisfied with the results, it must incessantly look for further possibilities to attain higher performance (quality).

The above mean that the authors extend the limits of the application of lean management since, instead of speaking of the organisation of the industry-level production of mass products, they refer to the process of creation of any product (or service), and to the relevant management principles.

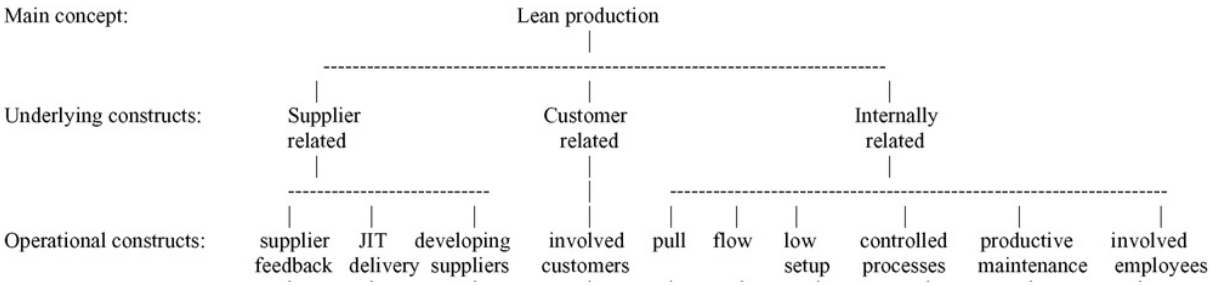
From this point on, lean thinking and the application of lean principles seem to take a separate course from Toyota and the motor vehicle industry. The book convinced many organisations active in other industries or sectors of the advantages of this way of thinking. And the organisations concerned were not afraid to test these principles in practice (Spear, 2004; Miller, 2006).

1.3. Lean management tools

There is no consensus between either the users or the researchers as to the tools of lean management. This is partly due to the fact that the authors who described the practice of Toyota relied on different information sources, identified different components of the system as essential and observed the use of different tools, and they wanted to draw their own conclusions etc. and, partly, to the fact that, with the spread of Lean, the various companies had different experiences and interpreted and applied the lean tools differently. The tool kit has kept expanding with the development of the system, and with its adaptation to western production practice. Annex 10.2. presents the results of research based on the processing of four extensive technical literature items and on corporate experience. Their comparison clearly shows the highly diverse nature of opinions concerning the essential tools of Lean.

In terms of the empirical evidence base, the paper by Shah and Ward (2007) excels from among the research projects listed in Annex 10.2. During their investigation, they mapped the lean management tools present in the technical literature and in corporate practice; they analysed their contents and consolidated them into 48 different tools. Their definition of "lean" tools takes into account the conceptual background of lean management. To present the interconnections of the 48 tools, they defined 10 underlying components (see Figure 4).

Figure 4: Components of lean management



Source: Shah – Ward, 2007, p.799.

With reference to the figure, the inner consistency identified by Shah and Ward (2007) can be summed up as follows (Losonci et al, 2007, p.12.):

"To maintain the continuous **flow***,* the products are assigned to product groups, and the facility layout is designed and the tools are placed accordingly. To provide for frequent series launches, the tools must be subjected to recurrent and regular *preventive maintenance*. The similarity of machines and products arranged in groups helps the employees recognise the problems. The flexible workforce and the workers in the autonomous work-groups are capable of fast and efficient problem solution (**employee involvement***)*. Active **customer involvement** lets the company rely on exact demand data. On the other hand, **fast change-overs** and stricter quality control (**controlled processes**) make it easier to plan the process outputs. The **pull system** and kanban provide for the timely production of adequate products in adequate quantity. These also demand that suppliers deliver basic materials of adequate quantity and quality on time. **JIT deliveries** are based on continuous **feedback** to the suppliers on quality and quantity, and training and **development** to ensure further improvement. Since no

company has unlimited resources, the supplier base must be reduced to a few key suppliers, with whom long, not short-term, contacts are to be concluded."

The tool system of lean production can be used efficiently in case of industrial production of large volumes, in response to relatively stable demand. This system, however, quickly reaches its limits if the demand for the products is low or fluctuates intensively. The situation may be aggravated by industry-specific features, such as the participation of the customer in the value-creating process, as in the majority of services. **Hines et al., however, pointed out that a "customer-centred strategic thinking" is adequate also outside the high-volume industrial production.** (Hines et al., 2004, p.1006.)

1.4. The relationship of TQM and Lean

As indicated in Section 1.2, in the opinion of Hines et al. (2004), TQM is one of the tools of Lean, in the sense that TQM, a previously independent management practice, has become part of Lean. This opinion, however, is not shared by every author. Practically all authors discussing this topic agree that quality improvement is key to Lean (pl. Shah-Ward, 2007), but many think that, instead of being part of the lean system, TQM represents a management system on its own (e.g. Flynn et al., 1990; Cua et al., 2001).

It is important to specify the interrelationship of TQM and Lean for my dissertation, since I actually used that to identify the Hungarian cases worthy of processing. So let me say a few words about that.

It is clear from the article of Richard Schonberger (2007) that he belonged to the first wave of researchers who set out to study the Japanese production systems at the end of the 1970s, when it was revealed that the progress of Japanese exports was attributable among other things to the use of several production management tools. In

1983, the author was present at a special forum organised with the participation of many theoretical and practical experts interested in the topic. One of the significant achievements of the forum was that it provided a valid definition of the interrelationship of TQC (later on TQM) and JIT/lean, viz. that "***they were mutually supportive co-equals"*** (Schonberger, 2007. p.408.).

Essentially the same position is shared by Dahlgaard – Dahlgaard (2006), who emphasise that lean management supports the general theses of TQM. Shimokava and Fujimoto (2009), on the other hand, speak of the role played by TQM within the Toyota Production System.

In what follows, I shall use the results of two research projects to specify the relationship of the two systems, which I shall compare with the findings of the Shah-Ward (2007) research described in Section 1.3.

The first research, the findings of which I shall represent considers the relationship of TQM and lean in two dimensions, production practices and performance (Flynn et al., 1995). The article defines the typical practices of each of the two systems and examines their respective and combined performances. What is important for our purposes here is the practices associated with the systems. Flynn, Sakakibara and Schroeder identified three classes of practice: JIT-specific practice, TQM-specific practice and so-called "infrastructural" practice, which essentially means the intersection of TQM and JIT practice. The attribute "infrastructural" was inspired by the common features of the practices concerned: according to the authors they represent the basis of both systems. The classification of the various practices by Flynn et al. (1995) is shown in the second column of Table 1.

Table 1: TQM/JIT (Lean): Comparison of research findings

Practices/elements	Flynn et al, 1995	Cua, et al, 2001	Shah – Ward, 2007
Committed leadership / management support	Infrastructural	Common	-
Plant environment	Infrastructural	-	-
Strategic planning	-	Common	-
Cross-functional training	Infrastructural	Common	Lean
Employee involvement		Common	Lean
Information and feedback	Infrastructural	Common	-
Supplier long term relationship	Infrastructural	-	Lean
Supplier quality management / certification program	-	Unique to TQM	Lean
Cross-functional product design and simplicity	Unique to TQM	Unique to TQM	Lean
Statistical process control	Unique to TQM	Unique to TQM	Lean
Customer focus/involvement	Unique to TQM	Unique to TQM	Lean
Setup time reduction practices	Unique to JIT (lean)	Unique to JIT (lean)	Lean
Small lot size (reduction)	Unique to JIT (lean)	-	Lean
Kanban / pull production	Unique to JIT (lean)	Unique to JIT (lean)	Lean
JIT delivery by suppliers	-	Unique to JIT (lean)	Lean
Equipment layout	-	Unique to JIT (lean)	Lean
JIT scheduling / Daily schedule adherence	Unique to JIT (lean)	Unique to JIT (lean)	-

Source: Table compiled by the Author.

The second important source of the classification of practices is associated with the names of Kristy O. Cua, Kathleen E. McKone and Roger G. Schroeder (Cua et al., 2001). The authors examine the effects of the introduction of TQM, JIT (lean) and

TPM, respectively, and of their interactions, on production performance. They review 19 literature items: *"The empirical studies that we draw upon are studies in the last 10 years that have sufficient grounding in the literature and assessment of measurement used in empirical analysis.*" (Cua et al., 2001. p.676.). They divide the "components" associated with each area into four parts: TQM-specific, JIT-specific (Lean), and TPM-specific components and "common" ones. They sum up their findings in spreadsheet format. Of the four categories, the TQM, JIT (Lean) and "common" components are important for us here. These are shown in Column 3 of Table 1.

A look at the fields of the Table 1, shows that the analysis of Cua et al. (2001) of the common and different components, respectively, of JIT and TQM rhymes in many respects with the findings of a similar survey by Flynn et al. (1995). As far as these two sources are concerned, not only the practices themselves (which are not presented in the table), but also their category labels correspond to one another to a large extent. The terminology of Shah –Ward (2007) is different, albeit the practices concerned are remarkably similar. Surprisingly, Shah –Ward (2007) identify as lean management – in addition to the components of JIT – also practices assigned to TQM by the other two sources. This variance affirms that (i) there is no consensus in the technical literature either as to the assessment of the various practices and (ii) Lean (lean management) is developing, and its content keeps expanding (Hines et al., 2004).

According Hines et al. (2004), lean management as a first stage of the identification of the system focused primarily on the production area and especially the tools which organise the material flow (JIT, kanban) in the strict sense. The extension of such solutions to without the company limits, e.g. to the suppliers, came in a later phase. This is how we should interpret the inclusion of a supplier JIT among the JIT-specific tools in a paper written in 2001. By and large the same applies to strategic planning, included among the common components. This, too, is an instance of JIT/Lean development, in the sense that the users increasingly recognise the strategic relevance of the system, and its close relationship with strategy creation. The change in terminology, namely that instead of making a distinction between JIT and TQM, the companies which applied both started to call them, comprehensively, lean management, is probably attributable to the same development. The underlying rationale is that all of these components were typically present in the production systems of "Lean" Japanese companies. Thus when the authors of "The Machine that Changed the World" (Womack

et al., 1990), a book providing a description of the Japanese production system, released their research findings, they applied the attribute "lean" and treated all tools applied there collectively[7]. Consequently, both TQM and JIT became part of Lean. The contents of the table confirms this statement.

As for the relevance of the above for this research, the interrelationship demonstrated in the table makes it obvious that the tools identified in the TQM literature are part of the lean management system as it is accepted today, in practice.

1.5. The vision of lean healthcare

"Lean thinking" by Womack – Jones (1996) already tackles the issue whether the lean principles can be used outside the automotive industry. Their answer is affirmative. The book, however, does not discuss a specific implementation scenario, nor its pitfalls; the authors leave that to the reader. They present lean healthcare as a "dream", a vision, which shows that not even the authors thought its realisation feasible in the short run (p.286.). Their vision is presented in the box below.

How would things work if the medical system embraced lean thinking?

First, the patient would be placed in the foreground, with time and comfort included as key performance measures of the system, These can only be addressed by flowing the patient though the system.

Next, the medical system would rethink its departmental structure and reorganize much of its expertise into multiskilled teams. The idea would be very simple: When the patient enters the system, via multiskilled, co-located team she or he receives steady attention and treatment until the problem is solved.

[7] Note, however, that several companies use only the TQM as their quality development system. Of course, they did not start to use the term "lean management".

> To do this the skills of nurses and doctors would need to be broadened (in contrast to the narrow deepening of skills encouraged by the current system) so that a smaller team of more broadly skilled people can solve most patient problems. At the same time, the tools of medicine – machines, labs, and record-keeping units – would need to be rethought and "right-sized" so that they are smaller, more flexible, and faster, with full complement of tools dedicated to every treatment team.
>
> Finally, the "patient" would need to be actively involved in the process and up-skilled – made a member of the team – so that many problems can be solved through prevention or addressed from home without need to physically visit the medical system, and so that visits can be better predicted.
>
> Over the time, it will surely be possible to transfer some of the equipment to the home as well, through teleconferencing, remote sensing, and even a home laboratory, the same way most of us now have a complete complement of office equipment in our home offices.
>
> What would happen if lean thinking was introduced as a fundamental principle of health care?
>
> The time and steps needed to solve problem should fall dramatically. The quality of care should improve because less information would be lost in handoffs to the next specialist, fewer mistakes would be made, less elaborate information tracking and scheduling systems would be required. The cost of each "cure" and of the total system could fall substantially.
>
> The problem of cures beyond our current knowledge would remain and the proposed lean transformation in health care is not directly helpful here. However, the lean transition could free up substantial resources which could be used for fundamental research to find new cures.
>
> (Womack-Jones, 1996, pp. 289-290.)

The underlying logic of lean health care is clear: as in the motorcar industry, a series of processes must be implemented for the organisation to attain its goal. "*Lean thinking concepts encourage health care providers to think about the patient's journey from*

admission to discharge as a complete care process rather than as a series of disconnected steps." (Ben-Tovim et al., 2007, p.14.).

The process steps would become faster and more economical if the amount of waste due to interfaces between the process steps and point-like optimisations could be reduced. From this point of view, it is irrelevant whether one speaks of motorcar assembly or patient therapy: the basic types of waste can be interpreted in both systems (see Table 2).

Table 2: Types of waste in industry and in health care

7 forms of waste	Industrial examples	Health care examples
Over-production	More products produced than necessary, or earlier than necessary.	Unnecessary tests, sterilisation of operating tools that are not used and the warranty of which expires.
Waiting	Waiting for information, instruction, material, technitian, final check, etc.	The patient must wait to be provided care, examined, discharged, etc. The personnel waits for instructions, test results, instruments, medication etc.
Transport	Of materials, parts.	Of patients, samples, test results, medicaments.
Over-processing	Use of excessively strict tolerance limits, extra fine processing.	Collection of data never to be used; preparation of reports, reports never to be read; over-complicated authorisation procedures.
Inventory	Storage of raw materials, semi-finished products, instruments, documents unnecessary for production.	Storage of (excessive amount of) materials, instruments, documents not needed for patient care. Storage of outdated materials, instruments.
Motion	Search for parts, documents, bending down for a part, stretching to reach a tool, repeating movements due to incorrect operation sequence.	Search for patient, nurse, doctor, medication, instrument, document; tasks repeated due to incorrect sequence, bending down/stretching to get hold of devices, materials, documents etc.
Defects	Non-compliant products.	Malpractice, nonconforming documentation, exchanged patients, instructions/procedures carried out in the wrong way, misinterpreted abbreviations, etc.

Source: Based on Graban (2009, p.43.)

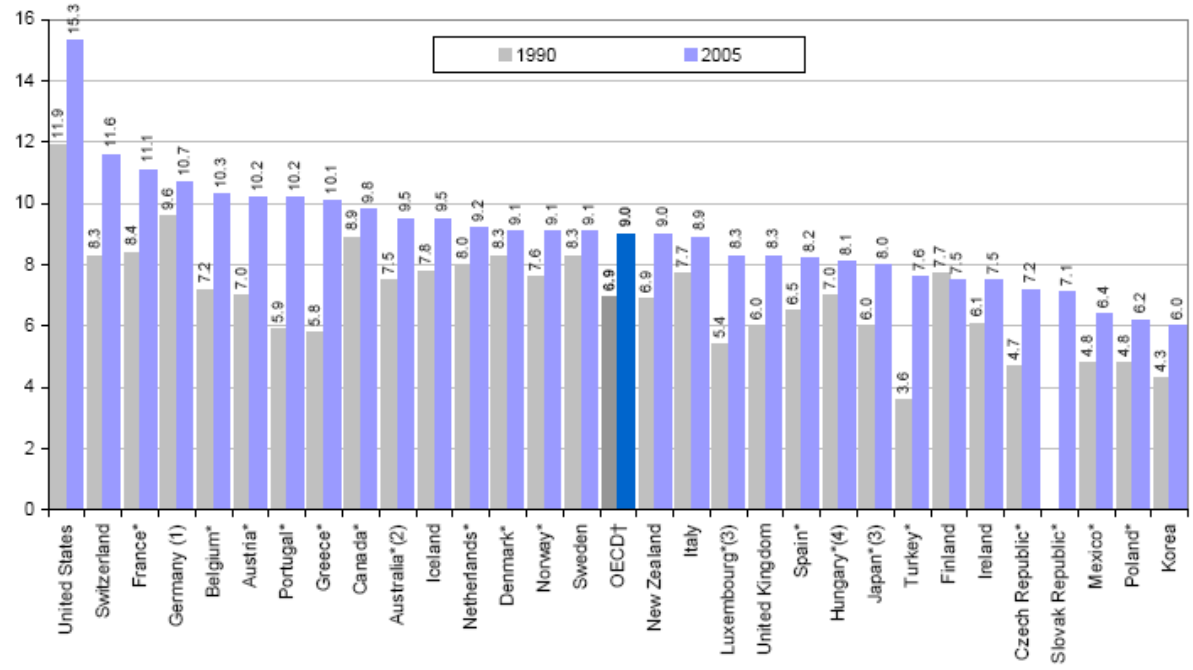
2. The health care context

The chapter presents the crucial environmental factors, i.e. the ones that exert the biggest influence on the lean transformation of hospital processes. The first section lists the arguments which urge the transformation of health care in general, and hence give a significant impetus to Lean. Then it quotes some works which call the attention to errors and wastes in hospital care. The rest of the chapter is devoted to the characteristics of health care services, different in many respects from those of production, and of relevance for the interpretation of the results.

2.1. Actuality of the transformation of health care: macro-level challenges

In recent years, the performance and expenditures of health care systems have moved to the focus of social and political attention in the advanced countries. In the globalising world, ever fewer of these economies can afford to finance the operation of their welfare systems in the same way as before (de Koning et al., 2006; Békesi, 2006). The health care systems, in particular, warrant special attention due to their significant and growing share in public expenditures (Figure 5), and their consequent major effect on such macro-economic indicators as the development of the general government deficit, for example. The growth of health care expenditures is the result of such trends, typical in the advanced economies, as the aging of society, conducive to the widening of the circle of beneficiaries as a matter of course, or the application of the results of scientific development, which implies the use of more and more expensive procedures, instruments and medicines. However, several countries, struggling in the grip of globalisation, can simply not bear a further growth of expenditures.

Figure 5: GDP-proportionate expenditures of the OECD countries, 1990 and 2005



Note: Countries left to right in order of health care expenditures in 2005.
† OECD average, not including the Slovak Republic.
*Series interrupted from 1990 to 2005.
(1) 1992. (2) 1990/91 and 2004/05. (3) 2004. (4) 1991 and 2004.

Source: www.oecd.org (2007)

It is due in part to the steady growth of health care expenditures that the quality of health care has moved to the centre of interest. Many sources agree that this sector is characterised by poor quality – poor results and wasteful operation – in many countries of the world. If that is so, then society has every right to demand the service providers concerned to reduce the wastes and improve the results of care provision.

The governments have set the target of the cost reduction or at least the prevention of the further drastic increase of expenditures the world over. These administrative measures, however, have proved ineffective already in the medium run, since people insisted on being provided quality health care (Gulácsi, 1999).

The same is supported by the fact that the decision-makers/managers of British health care are dissatisfied with the system and keep looking for development opportunities (Proudlove et al., 2008; Young – McClean, 2008). As stated by a former

director of the clinical administration, the developments must find new courses; a mere increase of the resources will not produce adequate results and, as far as the NHS is concerned, capacity problems are due to everyday routines, habits, which no one has ever tried to change (Bennett – Lister, 2006 cited by Parnaby – Towill, 2008).

De Koning et al. (2006) also agree that the development of the care provision processes may play a significant part in harnessing the growth of macro-level health care expenditures (Kim et al., 2006), for "…*a major source of the growth of health care expenditures is operational inefficiency, and that is not a necessity at all. Health care professionals can influence that* (De Koning et al., 2006, p.4.).

The macro-level system is the totality of the entities (institutions) constituting the health care system. Initiatives which affect several institutions in the same way will obviously produce change also at macro level. Let us quote an estimate to support that correlation: if the hospitals of the US (some 5-6000) could all implement the developments realised by ThedaCare through the application of Lean – 25% drop in the costs of in-patient care –, the country would save USD 400 billion over 10 years – in in-patient care alone (van Susteren, 2009).

2.2. Actuality of the transformation of health care: micro-level challenges

This section demonstrates why it is inevitable to transform health care at the level of service provider institutions. In particular, why it is important to improve the quality and cost-effectiveness of the health service processes in the developed countries (Hungary included). It presents some international researches which highlight these problems. Although they mostly present the health services of the US and the UK, given the nature of the problem, the situation is probably similar also in the other advanced economies. This hypothesis is apparently corroborated by the experiences of research projects carried out in other countries (Laursen et al., 2003; Brodt, 2006; Kollberg et al, 2007).

In Autumn 2006, a team of consultants visited Royal Bolton Hospital, which is located in the Manchester region and is part of the British National Health Service. The consultants were invited by the hospital management to survey the hospital processes. This is what they said about their experiences (excerpt): "*We have encountered significant frustration, as well as delays, duplications, over-complicated processes and poor communication – many processes seemed useless and full of wastes – many people struggled to remedy them.*" (Schenk, 2006, p.4.). Of course, this is but one example from the many hospitals of the world. Nevertheless, as will be shown later on, it is not an exceptional one.

The research launched in 1997 in the USA by the Institute of Medicine to survey security and quality levels in their health care institutions (especially hospitals) came to the conclusion that health care struggles with major problems in need of urgent solutions (IOM, 2000):

"Experts estimate that as many as 98,000 people die in any given year from medical errors that occur in hospitals. That's more than die from motor vehicle accidents, braest cancer, or AIDS – three causes that receive fare more public attention. Indeed, more people die annually from medical errors alone than from workplace injuries. And, although errors may be more easily detected in hospitals, the problems extend to every health cares setting, including day-surgery and outpatient clinics, retail pharmacies, nursing homes and home care. Add the financial cost to the human tragedy, and medical error easily rises to the top ranks of urgent, widespread health problems." (IOM, 2000, front flap)

Other sources suggest that the number of patients who died due to hospital infection is of the same order of magnitude as that of deaths due to false medical decisions. Moreover, for every patient who dies due to medical error or hospital infection, there are 5 to 10 others who suffer infection with less severe consequences. In other words, at the turn of the millennium, in the USA, of 1000 people subjected to hospital care for some reason, 88 were infected, injured or provided wrong therapy, and 6 among them actually died due to that (Spear, 2005). That is, the error rate of the

service is 8.8%; its adequacy rate is 91.2%, and the rate of fatal error is 0.6% (adequacy: 99.4%).

In the other services, a quality rate of even 99.9% (which would require the reduction of all problem cases to 88th of the current number and the number of fatal cases to one-sixth of the current value at the hospitals) is already unacceptable: it is inconceivable, for example, to have two dangerous landing events at O'Hare international airport or a daily 32,000 debit transactions posted to the wrong accounts in the US (Leape, 1994).

As addendum to the above, it is worth getting acquainted with the results of a research project which observed the activity of 26 nurses in 9 hospitals for a total of 239 hours. Records were kept of errors made (i.e. of nonconforming activities, such as portioning of medication first, inspection of patient data to check over-sensitivity to the given substance afterwards), and of problems incurred (i.e. external reasons preventing the personnel to do their work, such as delayed arrival of the ordered medicine or breakdown of equipment). Data analysis yielded the far-from-surprising result that the number of problems exceeded by far that of the errors. The rate was 167/24 (Tucker and Edmondson, 2003). However, one must not forget that, as indicated by West (2000, cited: New et al., 2008, p.4): "*... major problems are generated by the uncontrolled accumulation of many minor things."* Hence for example a data form put at the wrong place, a puddle left without supervision or a phone message noted down inaccurately may have significant consequences. To get a realistic picture of the rate of the daily occurrence of problems which hinder the activity of the medical staff, but which have never been in the centre of attention, although they deteriorate service quality and, not in the last, financial efficiency, the frequency-of-errors data must be complemented with these observations.

The example of the US is not unique among the advanced countries as far as quality problems are concerned. Surveys carried out in the National Health Service hospitals in the United Kingdom showed that one of every 10 hospital patients is the victim of a negative event of some kind: they get the wrong medication, fall down or off something, suffer infection or are given the wrong diagnosis (National Audit Office, 2005; Fillingham, 2007). The situation seems even more serious, considering the research results of Tucker and Edmondson (2003): *"...despite intensified attention to*

these problems, it seems that the hospitals do not learn from the problems and errors encountered by the staff during their everyday work." (p.56.).

Burgess et al. (2009) and NHSIII (2007) warn of efficiency deficiencies on the basis of their experiences at the NHS hospitals (e.g. multiple recording of patient data, multiple patient movements due to lack of organisation, long waiting times for doctors/nurses, indiscretion, lengthier hospital stay due to lack of co-ordination in the discharge procedure etc.)

Although no precise data are available on the Hungarian situation, the results of surveys initiated by the SE Health Services Manager Training Centre confirm that, in terms of undesirable events, the Hungarian hospitals are no exception: the list includes development of decubitus, falls, wound infections, medication errors (Belicza, 2008), with direct impact on the state of the patient, and events which deteriorate "only" the (production) efficiency of hospital operation; e.g. cancelled operations (Belicza, 2008; Kránicz et al., 2008). Furthermore, presumably, this sector is not exempt from malpractice in Hungary either: "*Estimates, albeit not adequately checked ones, suggest that ...annually ...* ***in Hungary, 3-6000 people die*** *due to incorrect treatment, undesirable events, malpractice.*" (Varga et al., 2005, p.199.).

Deficiencies impacting on patient security as well as errors of care are related to low process efficiency (Tucker, 2004; Tucker and Edmondson, 2003; New et al., 2008). Based on own research, New et al. (2008) state that, with stable processes, the staff has more time to care for patients. Thus, for instance, if medicines are arranged in some order and stored separately from liquids, nurses will probably spend less time finding what they are looking for.

Health care processes typically include a significant proportion, up to 35%, of non-value-adding elements (Murphy, 2003). According to Mezőfi (2007), in Hungarian emergency patient care, 28 minutes of patient care on average is associated with 119 minutes of patient waiting time, that is, only one fifth of the time spent by the patient in the system is useful. Jimmerson et al. (2005) suggest that the reason of these low rates is the frequent lack of task specifications which, in turn, leads to inconsistencies in care provision, to reduced service reliability, and unplanned events which often disturb the work of the staff. These circumstances, of course, imply higher costs, lower efficiency, higher error rates and, last but not least, a frustrated staff (Jimmerson et al., 2005). In

the health care organisations, the staff usually work in functional silos: the wards operate individually, the process-centred approach is absent. Often, the only person who has a clear notion of the patient's journey through the service is the patient himself. The information processes associated with service provision are even more complicated: they may amount to five or six times the patient journey. Unclear and over-complicated processes generate many errors, duplications and delays, and they frustrate staff members in direct contact with the patients, who cannot provide service of satisfactory quality despite their best intentions (Fillingham, 2007, Parnaby – Towill, 2008).

Let us note again that a major part of the problem is attributable not to the inadequate professional skills, attitude or efforts of the staff, but to the system in, and the processes amidst which they must work (Spear, 2005). The primary cause is the historical heritage. Traditionally, hospitals relied on their highly skilled and devoted professional staff members to ward off occasional operational errors. That is, quality service used to be guaranteed by the excellent medical and nursing staff, not by excellent systems. This approach, however, is about to change now, due exactly to the relevant, growing, social pressure.

For, an increasing number of initiatives target the systematic identification and elimination of errors (Tucker and Edmondson, 2003). The Hungarian programme called NEVES, for example, was designed to explore the generic root causes (systematic errors in care provision), and to improve communication, information supply, education, process organisation and management, to fine-tune staff planning and organisation, and to upgrade the allocation, use and operation of equipment and instruments (Belicza, 2008).

The initiatives concerned, however, have seldom resulted in a quantum leap. This is how Brent James, Director of the Intermountain Healthcare (Salt Lake City, USA) Institute for Health Care Delivery Research put it, *"Quality development methods made their first appearance in clinical practice 15 years ago. Despite some successful projects, most organisations have difficulties in the comprehensive application of the system to this day. Although they can already achieve results on a small scale, the extension of individual projects to organisation-level sustainable developments has remained a problem."* (internationalforum.bmj.com, 2008).

Timeliness is another important issue of health care. Patients want not only high quality professional services, but also want it within a reasonable time. According to a recent survey which was representative in Hungary, the customers of Hungarian health service providers rated waiting times and the keeping of appointments lowest (WEBBeteg, 2009). Waiting times usually affect only the degree of satisfaction of the patient, but the length of hospital stays certainly affects their state of health as well: the longer the period of in-patient care, the higher the risk of undesirable events (e.g. infection).

As indicated by the circumstances described above

1. Health care services are characterised by low process efficiency;
2. Health care services are in need of cost-effectiveness development, due also to external factors;
3. Health care should pay more attention to the quality of the service;
4. Despite some initiatives to implement quality development programmes in health care, these have typically had no breakthrough effect.

What has been reviewed in this chapter certainly explains the intensifying interest in Lean of health care administrations and managers the world over.

2.3. Effects of the special features of health care on lean transformation

It is imperative to take stock of branch-specific differences in connection with the examination of the new application of Lean in health care. This chapter will tackle that issue.

Before embarking on a more detailed examination of the health care system, let's take a look at it from an economics perspective:

Certain inputs are needed for the "production" processes of health care, including, in addition to the typical industrial production items (workforce, machinery, equipment, materials, structures) the patients. Since the patient himself exerts a major influence on the care process and its outcome, it is rather difficult to assess the real performance of the system. A further problem is the ambiguity of the notion of "performance": depending on the approach ever, it may refer to state-of-health as an assessment criterion, but also to many other criteria or a combination thereof. This large array of possible performance evaluation options is a significant problem as far the unambiguous performance measurement and direct employee feedback objectives of the lean system are concerned.

Another major problem in health care is the definition of the "customer" and the consequent identification of "customer value", the point of departure of lean management. The relevant causes (due mainly to the specific health care financing system) will be described in detail later on.

Let us investigate now the three essential feature clusters of health care services which have significant influence on the adaptability of lean management:

1. Health care is a service, not a production activity.
2. The overwhelming majority of (Hungarian) hospitals operates as central budget institutions.

3. Hospitals operate as professional service provider organisations (Mintzberg, 1979).

The above three features will be expounded in the sections to come.

2.3.1. Hospital care as service

Generally speaking, service processes typically differ from production ones in the following respects (Morris – Jonhston, 1987, Chikán, 2003):

- The outcome of the service is not tangible.
- The outcome of the service cannot be stored; that is, its creation and consumption coincide.
- The customer takes part in the process.
- A certain part of the processes takes place under the eyes of the customer, whereas another part remains invisible to him/her.

Of course, the above distinction applies to "pure" production and "pure" service provision. Health care services and, in particular, hospital care are almost *par excellence* "pure services". Consequently, in contrast with many other services, the service characteristics listed above apply to them, viz.:

- The outcome of the service is not objectified, since care focuses on human beings, and the material flow is a secondary process (Bertrand – de Vries, 2007)
- The final state to be achieved as a result of the service is difficult to define/to define exactly in advance. (Bertrand – de Vries, 2007)
- Since the outcome of the service cannot be stored, the service provider organisation must be prepared for fluctuating workloads: the demand is (often) impossible to predict or (often) demands immediate care. The objectives of Lean help solve this problem by enhancing the flexibility of

the system which, in turn, becomes more capable of responding also to this special challenge (Ghosh and Sobek, 2006).

- At the same time, when the target to be changed is selected, one must separate the processes characterised by significant variability and the recurrent activities. Research has demonstrated the existence of many recurrent processes in health care, to which it is logical to apply the lean principles (Ghosh and Sobek, 2006).
- Since assignments related to the transformation process may imply significant extra workload in addition to the daily routine, provisions must be made to relieve the workers of some of the burdens (Fillingham, 2007).
- Since the targets of the "transformation" in health are typically humans, it is essential to interpret and communicate the lean principles and tools adequately. Naturally the personnel will anyway point out that the subjects of these processes are sensitive human beings and not motorcars. (Fillingham, 2007; Radnor et al., 2006).
- Quality is interpreted differently in the services area than in industry: in addition to the outcome, the process itself is evaluated as well (Parasuraman et al., 1985).

After this review of the special planning requirements due to the service specifics, let us discuss another typical feature of health care: the division of the person being served and the one that finances the service.

2.3.2. The difficulties defining the "customer"

The point of departure of the five steps of lean thinking is the definition of customer value. In Toyota, the user of the product can be defined unambiguously, and so the company is in a good position to define customer needs.

In health care, on the other hand, it is not quite clear who the "customer" of value created by the organisation is. For instance, health care must provide also for

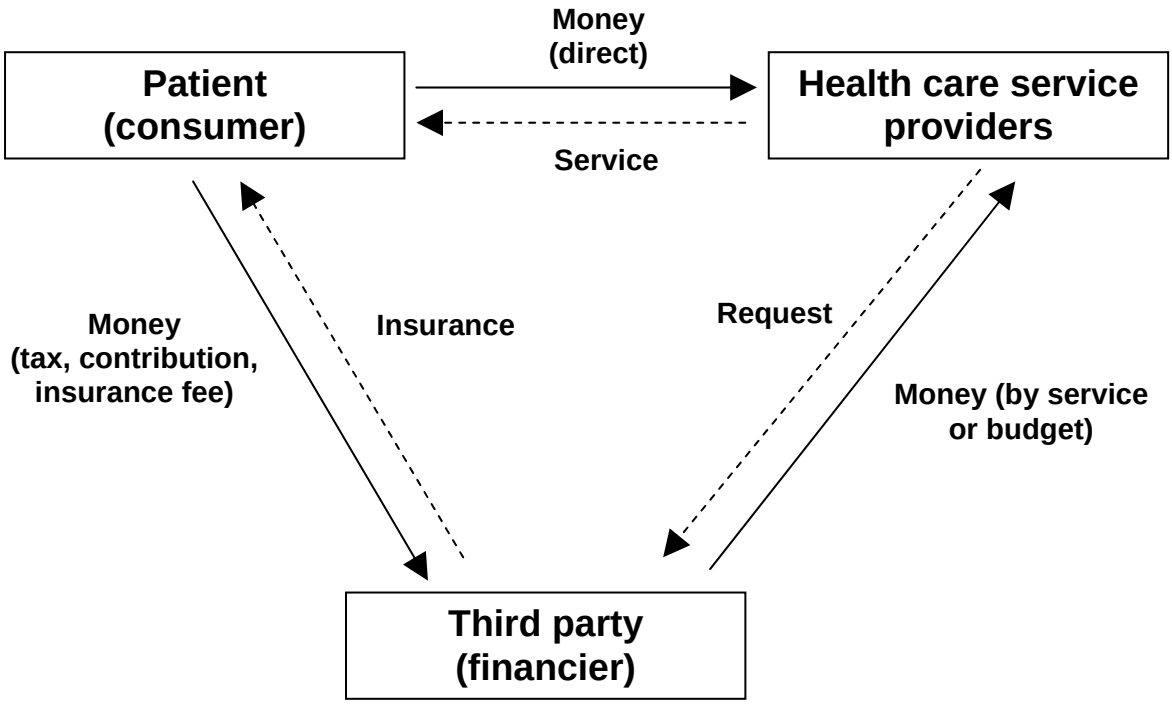
incapacitated individuals (who cannot make decisions). Consequently, the financier (who pays for the service), the customer and the person deciding on the fate of the customer are distinct entities and hence “customer" as understood in the terminology of micro-economics is divided into three parts (Kornai, 1998). The picture is even more complex if we add the role of the municipalities which maintain the institutions, the administration (ministry), which mediates/represents the will of the tax-payer citizens and also the direct regulatory authorities.

His financial concernedness notwithstanding, the beneficiary of the service (the patient), who can evaluate the performance of the organisation (at a certain level), will only provide a certain part of the counter-value of the service if he pays for it at all. Hence the performance of the service provider and the counter-value of the service are separated from each other, which makes feedback more difficult. It is therefore difficult to grasp the essence of “customer value”. This problem is one of the crucial issues of this research.

Another major difference relative to the market conditions is the limited decision-making power of the individual: the patient cannot choose any of the services on offer at his discretion (without limits in space and time). The services do not compete; the goal is not the comprehensive survey and satisfaction of the patient’s needs. Let us add that the institutions concerned have no comprehensive decision-making competence either: both the hospitals, for example, and the financier organisations operate within certain limits.

Consequently, health care service providers operate in a particularly complex environment (Figure 6.).

Figure 6: Intra-health care economic relationships



Source: Orosz, 2003, p.202.

2.3.3. Health care institutions as professional service provider organisations

Professional services (generally speaking) are provided by highly qualified staff whose professional knowledge and skills are honoured. This service trait, has several consequences:

- The "professional" commands special knowledge; his performance can only be judged by another "expert" of the field, not by outsiders (Mills et al., 1983).
- Individual responsibility is decisive (Mills et al., 1983). Owing to the special knowledge/skills required, there is no team responsibility. Consequently, it is difficult to adapt team work, one of the essential tenets of Lean, to this area.

- Individual autonomy enjoys considerable protection. Problem definition and solution generation is only feasible on a voluntary basis, without any external pressure (Mills et al., 1983).

The following can be pointed out if we interpret/apply the above features in the health care services context:

- Health care provider organisations typically have several, competing, leading power groups. In addition to the management, the group of physicians as well as the interest representation and leaders of the nursing staff also play a major role in decision-making (Bertrand and de Vries (2007).
- The key actors of the services are highly qualified specialists (doctors) who generate demand for further services and at the same time take part in service delivery themselves (Bertrand and de Vries (2007).
- There are some teams in hospital care (e.g. operating teams) (Ahlström, 20004), so the relevant general statement about the missing teamwork above is not fully correct. Nevertheless, there are typically strictly defined rules and responsibilities within such teams, which again results in unquestionable individual decisions on certain issues (e.g. the anaesthesiologist alone may decide to cancel the operation).

Consequently, any effort to streamline the health care processes must take into consideration the natural needs, attitude of the professionals involved, lest their natural resistance to change should intensify. This will probably be a key point of the adaptability of the lean system. For this reason, it is of utmost importance to understand and take into account the attitude of the individual professional groups (doctors, nurses) in this research.

3. Methodological tools and the framework of the research

This chapter reviews the research methodology and the development of the code system which was used as a framework for the analysis of the cases. Finally, it presents the elements of the code system in detail.

3.1. Definition of the research objective and methodology

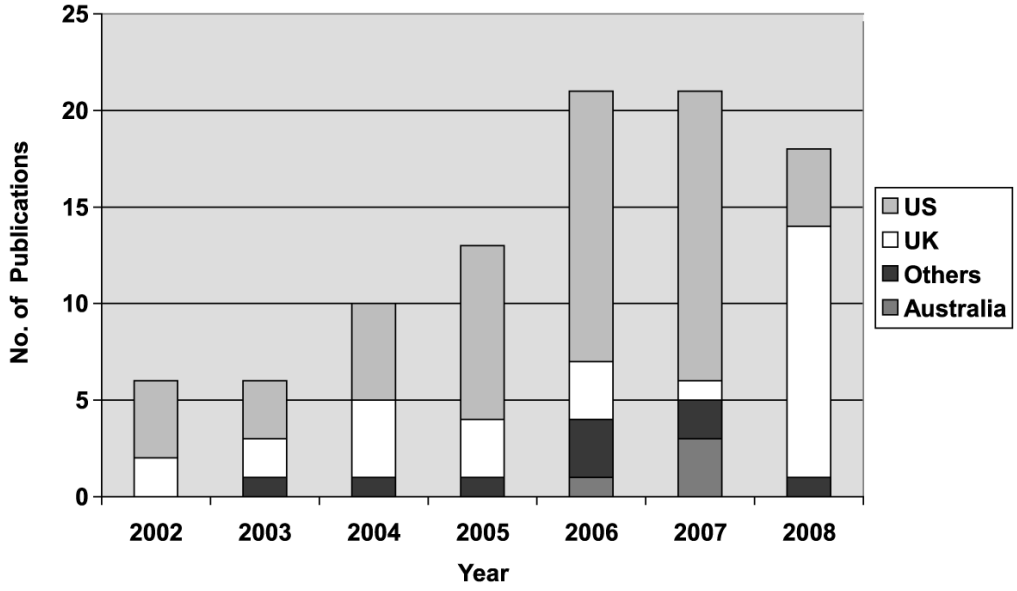
The section begins with an explanation of why the synthesis of previous experience was chosen as research topic, and then it describes the research methodology.

3.1.1. Definition of the research objective

The research of Brandao de Souza (2009) has been unique to this day in that it provides a systematic exposition and classification of scientific articles on Lean in health care. He found 95 relevant articles in the technical literature accessible in the biggest databases (closing date: August 2008; see Figure 7). As shown in the figure, the first articles on Lean in health care appeared in the scientific reviews in 2002; then their number rose exponentially until 2006. In 2007, it stagnated (the year 2008 was not a complete year). The author studied the geographic origin of the articles: the great majority originated from the US (57%); the second largest segment was that of British publications. The number of the latter rose significantly in 2008. 29% of articles

originates from the UK; 4% from Australia, the rest from other countries such as Denmark, Canada, Sweden (Laursen et al., 2003; Brodt, 2006; Kollberg et al, 2007).

Figure 7: Development of the number of publications by country, 2002-2008



Source: Brandao de Souza, 2009, p.131.

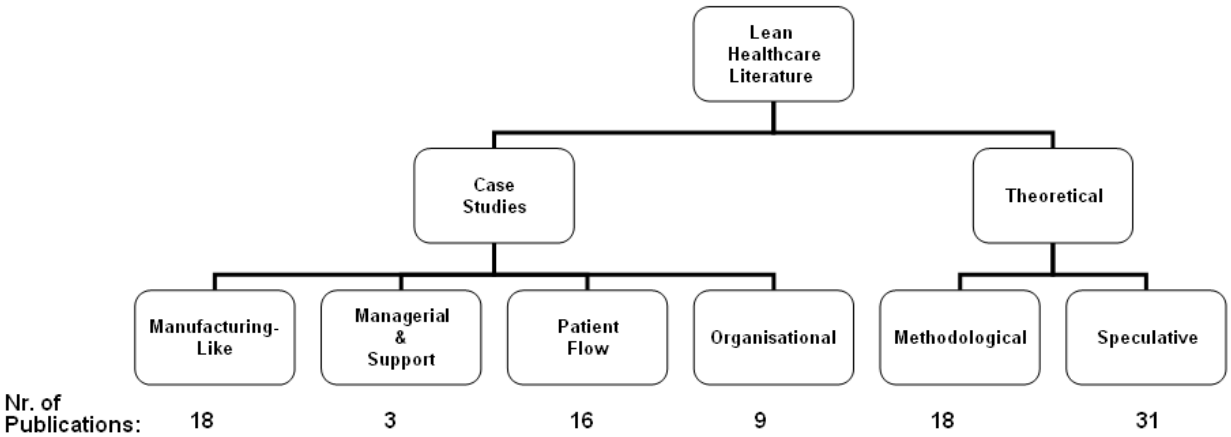
Brandao de Souza (2009) notes that, in all probability, the real number of scientific publications exceeds what is covered by his presentation, since his methodology does not exclude the possibility that some writings be omitted. His proposition is supported by the fact that the presentations at the annual EurOMA[8] conferences, for example, are not covered by the paper. There must be much more than the indicated 95 publications, considering also the sources which do not aim at the communication of scientific information. There are many other writings on the topic in dailies (e.g. the Minneapolis Star Tribune, Acron Beacon Journal) and on the Internet (www.lean.org; www.ihi.org; www.hpp.bz).

Brandao de Souza (2009) assigned the papers to six content-based categories in the taxonomy developed by himself (see Figure 8). According to that classification, 49 of the 95 articles were theoretical ones, but 31 among them only called the attention to the outcomes of Lean (speculation), whereas in another 18, the authors provided some

[8] European Operation Management Association (www.euroma-online.org)

points of reference as to how lean transformation ought to take place (methodological articles). The common denominator of the other four major groups was that they described concrete cases. Brandao de Souza (2009) found 16 articles describing cases of the lean transformation of patient care. 18 articles were devoted to the lean transformation of the "production-type" processes of hospital operation (e.g. pathology workflow), 3 to management processes (especially information flow, IT). Another 9 concerned related organisational matters.

Figure 8: Taxonomy for Lean Healthcare Literature and the Number of publications by category



Source: Based on Brandao de Souza, 2009, p.131-132.

Brandao de Souza (2009) remarks that, to his knowledge, no article undertook to provide a comprehensive overview of the available sources. His research has been unique in this respect in this area. **His article, however, provides no in-depth analysis of the publications, only the classification of their contents. This is the reason why the structuring of the published empirical knowledge still needed.**

The first phase of scientific understanding is to observe and investigate the phenomena. That is, explorative research is probably the best alternative when you approach an "emerging" area. Lots of researches of this kind are needed to have sufficient information to take the next step in scientific understanding: to move on to the comprehensive, detailed description of the area under study (Karlsson, 2009).

Relatively little scientific knowledge is available to the world on the lean transformation of hospital operation and one third of the publications are no more than "speculations" (Brandao de Souza, 2009), which do not necessarily promote the objective understanding of reality. Since the first hospitals probably embarked on lean transformation in the early 2000s, this is no surprise. On the basis of the above, one might say that this area is in the early development stage, corresponding to the stage of explorative research. At the same time, there is an urgent need to consolidate the growing amount of empirical evidence on the topic, firstly to inform experts active in practice and to highlight the key points and, secondly, to define the areas where lots of consonant evidence has been collected already, and the ones laden with contradictions or in need of intensive research due to lack of observation, to enhance the efficiency of further research.

On the basis of the above, I defined the objective of my research as follows:

Collection, structuring and description of empirical evidence on lean transformation of hospital processes.

The methodology designed to attain the research objective is presented in the following section.

3.1.2. Research methodology

The research objective defined in the previous chapter, i.e. the structuring of available pieces of information, can be realised along two essentially different courses. (1) Independent data collection, provided that the necessary resources and time are available. (2) In case of limited resources, collection and evaluation of as many pieces of information described by others in relation to specific cases as possible.

Even if the necessary resources were available, the results provided by Version (1) would not necessarily differ significantly from those provided by Version (2). On the

other hand, Version (1) makes it easier to control the data collection process and to understand the situation, which improves the reliability and validity of the research

I chose the second course of research – due mainly to the scarcity of the available financial resources. I am fully aware of the fact that the use of case studies as secondary sources considerably reduces the validity of the research (findings): the pieces of information I used were not collected and described according to the research objectives and, indeed, sometimes little is known about the data collection process as such. I believe that the results which may serve as a point of reference will nevertheless represent a major step ahead for researcher society and experts active in the field. Since the validity of the initial data not evident, there was no reason to use detailed and sophisticated analytical techniques in the analyses. Consequently, I made no detailed analyses of the interrelationships of the factors, for example.

I adhered to following research scenario:

1. I identified the sources which themselves provided a structured overview of the collected pieces of information based on a criterion of some kind. I found four such works on the lean transformation of hospital activities. Spear (2005) sums up his first-hand experiences gained at several hospitals. Radnor et al. (2006) examine and describe in a systematic way their experiences mainly of the lean efforts of public institutions in the area of Scotland, UK. Proudlove et al. (2008) describe the research experiences of British NHS[9] in connection with the application of another methodology which is similar to Lean. Finally, Young – McClean (2008) also sum up first-hand experiences gained at hospitals in the United Kingdom.
2. I structured the contents of the articles by open coding. That is, I assigned conceptual labels to blocks of information related to Lean in the articles. Then I merged the logically related labels and gave each group the name which best summarised it. I identified 41 Lean factors this way, which I then assigned to 12 main categories. When the code system was ready, I re-read the texts to check the classification of the text parts and to make alterations if necessary. The code system presented here is the result of several checking cycles. It represents the

[9] NHS: National Health Service

map which outlines previous information and provides a framework for the analysis of further cases.

3. I collected from the international scientific databases the scientific articles on Lean projects implemented at hospitals. I structured their content according to the category system established previously, and then I compared that with the corresponding pieces of information obtained from the basic literature items.
4. To remedy the deficiencies of the international case descriptions and to create a kind of control case, I identified a Hungarian development project which corresponded to a large extent to the objectives and approach of Lean. To do so, I first demonstrated on the basis of information and empirical research findings accessible in the technical literature that the application of the TQM approach and Lean have a significant intersection, which justifies the use of a case which applies TQM "only", not lean management. I processed the case so selected, too, according to the previously established category system, and I kept comparing the results with information based on the basic literature and with the results of the analysis of the international cases.
5. On the basis of the basic literature items, the international cases and the case of the Hungarian hospital, I summarised the scientific knowledge base which is currently available on the lean transformation of hospital operation.

As for the generic applicability of the research results, it is a question to what extent the operational logic of profit-oriented and not-for-profit hospitals differs. Do the Lean factors differ in function of the type of organisation subjected to research? Although, intuitively, one might assume that certain operational objectives, such as the attitude to profit generation (profit-oriented vs. not-for-profit), may exert a significant influence on the developments, the research projects of Yasin et al. (2002) have demonstrated that this is not so. According to the interview-based survey of the hospitals of the State of Tennessee, US, **the differences in the frequency and outcomes of certain development programmes taken over from the industry were attributable not to the hospital's attitude to profit generation, but much rather to its size.** This finding is supported by the fact that the authors of the basic literature items make no reference at all to the developments being related to profit targets. Therefore,

in the rest of the research, I shall not consider the hospitals' profit orientation a prominent factor.

In what follows, I shall present the above works in more detail; then I shall sum up the results of the summary of their contents, and complement that with related information and views expressed in further technical literature items.

3.2. The basic literature on the topic

In what follows I shall present the four basic literature items selected for the research. Each presents facts and relationships concerning the Lean based on several individual cases.

Spear (2005) reports on his first-hand experiences of lean transformation in hospitals in the US, according to the approach proposed by him. Radnor et al. (2006) sum up the experiences of lean transformation programmes implemented in public sector institutions in Scotland. The article by Proudlove et al. (2008) is also about experiences related to the NHS, but these originate from the application of another development methodology, similar to Lean: the six sigma. Finally, the reader will get acquainted with the experiences of Professor Young (Young – McClean, 2008), who tracked NHS's efforts aiming at the lean transformation of hospital processes for years.

Table 3 sums up the main features of the four basic literature items.

Information contained in the above table warrants some comments. The short list is indicative of the limited knowledge on the topic. Moreover, the described experiences originate almost exclusively from the hospitals and clinics of the US and the UK, that is, they say nothing, directly, of hospitals active in other parts of the world.

Table 3: Comprehensive survey of the basic literature on the topic

Reference	Topic	Nature of information	Observed organisations	Location
Spear, 2005	Research experiences concerning the application of the 4-step method proposed by Spear	Expert experience, opinion	For-profit and non-profit hospitals and clinics	USA
Radnor et al., 2006	Lean experiences in the public sector	Result of systematic research	Central administration, municipality and other non-profit service providers (hospitals included).	Scotland
Proudlove et al, 2008	Relevance of intra-NHS six sigma experiences for Lean	Research findings, conclusions	NHS hospitals	United Kingdom
Young - McClean, 2008	Lean efforts and experiences within NHS	Expert experience, opinion	NHS hospitals	United Kingdom

Source: Table compiled by the Author.

The table shows that in addition to being scarce, available knowledge is based in half on expert opinion (which, however, valuable, cannot replace systematic research), or the focus of the research was not the lean transformation of hospital processes. The research of Radnor et al. (2006) covers but a small number of hospitals, whereas that of Proudlove et al. (2008) targeted the application of six sigma.

3.2.1. Application of Lean in hospitals in the US (Spear, 2005)

The first article to be presented among the primary literary sources of my research was published by Steven J. Spear in the September 2005 issue of Harvard Business Review (HBR), and it had had a major impact on researchers and professionals alike of the development/lean transformation of the health care services. Its positive reception was guaranteed by the author's person: Steven J. Spear's previous publications have won attention and acclaim. As is revealed by his article co-authored by Kent H. Bowen, "Decoding the DNA of the Toyota Production System"[10] (HBR, 1999) and his "Learning to lead at Toyota" (HBR, May 2004), Spear has studied the Toyota

[10] The article was published in Hungarian under the title of „A Toyota termelőrendszer DNS-ének megfejtése" in the August 2004 issue of Harvard Business Manager.

Production System at the Toyota plants, in practice, for years. His writing on the lean transformation of hospital care was based on the experiences of fives years of project monitoring in a number of hospitals in the US, as he tells himself in the article. Although the paper is not about the results of a systematically planned and implemented research project (hence it is difficult to rate its reliability), but of "expert" experiences gained at several locations, as a result of several development projects, it is so richly illustrated with the details of the cases that I accept the experiences it tells about as important and genuine for the purpose of my research. The article is all the more important since it was the first to call the attention to the topic in a high-prestige management review.

Spear (2005) actually describes the use and results of a tool kit (to use Spear's phrase, for the development of "organisational capabilities" (p.82.)). This set of tools is obviously backed by the, somewhat modified version, of the principles identified as the **DNA of the Toyota Production System** (Spear – Bowen, 1999). Three of the four rules in the original text refer to employee activities, inter-personal communication and, in general, the simple and regulated nature of the processes, and only the fourth is about problem-solving. However, as stressed by the authors themselves, all four rules contribute to fast problem identification and elimination through hypothesis creation and testing. Spear – Bowen (1999) emphasise that the principles concerned actually grasp the capacity for organisational learning behind Toyota's unbroken development (Fujimoto, 1999). Spear's article (2005) introduces a new foursome of rules, of which only the first is about the organisation of activities/processes, and the remaining three concern problem exploration and solution, the dissemination of new solutions and, finally, the development of the capacity to learn:

1. "*Work is designed as a series of ongoing experiments that immediately reveal problems.*" (p. 82) That is, the execution of every task is planned down to the smallest detail, to ensure a clearly defined outcome. If the planned process cannot be observed or the result outcome differs from the plan, that is a clear indication of the presence of a problem.
2. Upon the detection of a problem, its causes are analysed and eliminated promptly. This prevents the recurrence of the same problem for the same.

3. "*Solutions are disseminated adaptively through collaborative experimentation*" (p. 82.) Thus viable solutions are used to solve problems also in other areas, but not by mere copying, but through the involvement of experienced professionals.
4. To sustain the system, the more experienced colleagues transfer their knowledge concerning precise process planning, description, problem analysis and solution to younger colleagues in the form of teaching and mentoring.

That is, Spear believes that "operational excellence" similar to that of Toyota can be attained through experimental capabilities developed in the organisation. That is, he does not follow the logic of the five basic steps proclaimed by Womack – Jones, albeit there is no doubt a discernible relationship between the two trends. (Note that Spear does not use the term "lean".).

In relation to the four rules or organisational capabilities, Spear (2005) first gives an impressive description of the nature and multitude of errors encountered in American hospitals. Then he proposes an explanation: the root causes of the deficiencies are the sophisticated systems and processes, and the fact that, in the absence of the organisation's capability of quick problem exploration and solution, the staff must find its way around the problems. This behaviour, however, does not help remedy the deficiencies, but rather perpetuates them.

In addition to the above, Spear (2005) shares with the reader many valuable experiences and conclusions in regard of the time demand of the change-over to the novel-type operational model proposed by him, and the spatial scope of the changes. He gives special emphasis to the presentation of the no doubt impressive achievements of the hospitals and wards which adhered to the approach proposed by him.

3.2.2. Lean in the public sector (Radnor et al., 2006)

Few descriptions and summaries are known of Lean experiences outside the business sector. One of these is about the research carried out under the leadership of

Zoe Radnor, on commission of the Scottish administration, by the experts of Warwick Business School, from August 2005 to March 2006. In the team leader's words, the research *"aimed to evaluate the application of Lean in the public sector to consider if it is an appropriate means to embed a culture of continuous improvement"* (Radnor et al., 2006, p.1.). The project is outstanding in its area, for the following reasons:

1. It projects a picture of the applicability of lean principles outside the business sector, and
2. it does so on the basis of research covering a wider circle, which provides for the generalisation of the research results.
3. The research results are accessible, down to the details; it is possible to evaluate their validity, reliability and generic relevance.

That is, the results of the research may serve as a basis for further investigations of Lean in organisations outside the business sector. However, since its scope includes not only hospitals, but many other public institutions as well, its focus coincides but partly with that of the dissertation, and hence its results presented below will only provide a point of departure – a highly valuable and solid one – for my research.

The surveys presented in Radnor's paper were carried out from August 2005 to March 2006. The research consisted of a literature review, a questionnaire-based survey (24 institutions - 3 areas of health care), case studies (8 cases – 2 health care areas) and pilots (3 locations - 1 hospital).

Reviewing the related literature the authors declare that Lean is no doubt based on the Toyota Production System, but they accept the summary of its underlying principles provided by Womack –Jones (1996), and identify the conceptual framework of Lean based on Hines et al. (2004).

According to the research, the organisations set out on the path of lean transformation mainly for external reasons, for the purpose, typically, of quality improvement, client satisfaction enhancement and process development. As for the implementation phase, two approaches prevailed, which are easy to link to the short- and the long-term thinking. The organisations departed from the lean principles, but

applied only a minor part of the usual industrial tools. The outcomes, on the other hand, are quite promising: service quality as well as client satisfaction and process efficiency improved. The success factors were similar to those of change management; the extra component being the adoption of the philosophical components of Lean. As for the main hindrances, public sector institutions are much slower to change than the industrial actors.

The research leader summed up the results of the research as follows:

"Analysis from the research with organisations in the Scottish public sector, together with evidence from the literature, indicates that Lean is transferable to the public sector and can be used to develop more seamless processes, improve flow, reduce waste and develop an understanding of customer value. Lean is most suited to organisations with high volume, repeatable tasks that allow greater standardisation and integration, supported by a less hierarchical management structure that allows empowerment and engagement of the workforce" (Radnor et al., 2006, p.5.).

It is always important to look into the validity, reliability and generic relevance of research results. Since the authors documented the research process and published the relevant information in this paper, one can pronounce a judgement on these aspects of the research (in contrast with the other three basic literature items). Several research methods were used. In the initial phase of the survey, the team contacted a larger number of institutions via questionnaires; then they subjected the responses to statistical analysis. Such "fixed" questions obviously enhance reliability, but the answers provided by the respondents may diminish it. Questionnaire-based interviews, on the other hand, may have a negative effect on validity, which was offset in the questionnaire through the inclusion of open questions. The research included case studies and pilots. These methods significantly increased the validity of the research. For these research results, representative generalisation is limited to the circle of Scottish public institutions. However, several statements are suitable for analytical generalisation.

3.2.3. Lessons of six sigma applications to prospective applicants of the Lean (Proudlove et al., 2008)

The third literary work deemed important for my research is again based on the experiences of the NHS, but instead of focusing directly on Lean, its conclusions and recommendations are based on the six sigma methodology. Proudlove et al. started out from the experiences of the so-called Six Sigma Green Belt[11] (GB) of the NHS Modernization Agency (MA). The aim of the GB programme was to test the possibilities inherent in six sigma for service development at the hospitals of NHS: *"It seemed that six sigma offers a systematic approach, focus on the exploration of the root causes of the problems, and more confidence in that the changes would bring about the desired results."* (p.28.). That is, the programme objectives were the same as those of the current, Lean, development programme. The change in methodology was not accidental: it was due to a large extent to the experiences of the MA GB programme. During the programme, 50 workers were provided first-level (GB) six sigma training, and then 14 projects were launched and their experiences were collected. The article describes the experiences and, after a comparison of the characteristics of six sigma and Lean, respectively, the authors call the attention to what promise to be the key areas for Lean. In what follows, I shall present these:

- It was a typical statement of the participants of the pilots that the processes to be upgraded were so unstable and chaotic that total overhaul rather than development was needed. The situation is expected to be similar when it comes to lean transformation.
- Six sigma presumes that the established processes are operational and, therefore, it only aims at their development. Since the NHS hospitals had many problems due to the process structuring, this point of departure often proved to be too narrow-minded. The programme participants considered it necessary to have a development methodology built on more comprehensive analysis (e.g. process evaluation).

[11] Six sigma realises the developments with expert assistance. To differentiate the knowledge and experience levels of experts, the hierarchy of the martial arts is used: the levels (from the lowest to the highest) are green belt, black belt and master black belt.

- The complexity of care provision and difficulties of process identification made it difficult to define "customer value". This, however, is key to Lean, since the determination of "value" is its point of departure. To define "value", some sort of balance must be created between the interests of the various stakeholders (patients, doctors, managers, regulatory authorities etc.).
- It was a problem with six sigma that the development programmes were not connected to the strategic objectives of the hospitals, or else the latter were not made explicit. This deficiency hindered the acceptance of the project objectives by the participants. We know of a single case of lean transformation within the NHS where the developments are implemented in a declared way in a strategy-level system. In the other hospitals, they are driven by local objectives, or by tactical ones at the most. This, however, threatens with the fast obsolescence of the development results and the danger of "restoration". The excessive number of local initiatives, on the other hand, tend to fragment the resources available for development.
- In comparison with the initial baseline status (chaotic processes), basically any development tool can produce dramatic improvement in the short run. Later on, however, when the processes have already reached a certain level, it is difficult to sustain the development. For example, the approach which currently prevails in regard of Lean, which defines value from the point of view of the patient, will not necessarily be sustainable if all the problems of health care financing are taken into consideration.
- The strictly defined six sigma methodology proved to be excessively cumbersome for health care workers. Therefore, Lean must strike a balance between a much too precise methods and the superficial approach of previous NHS development efforts. It is important that Lean should adopt a systematic approach, but the development tools must be adapted to the capabilities and expectations of the project participants.

- Six sigma has often been criticized for its complicated language, alien to health care practice. Lean must try to approximate normal everyday practice in that regard as well.
- Health care service is too complex to find optimum solutions by simply looking at it from a single perspective. Therefore, whatever development programme an organisation embarks on, it must strive to understand as many aspects of the problems, phenomena, as possible. The application of six sigma was criticized among other things for not paying sufficient attention to the human factor. Since the same argument is often voiced against Lean as well, the heads of the development programmes must pay special attention to offset that.
- In six sigma, project leaders often found it difficult to compose the development teams and to keep them together. The most frequent reason was physical distance on the one hand and the diversity of the knowledge and skills of team members on the other. It is recommended to pay special attention to these factors during the recruitment of Lean development teams.
- Since hospital workers do not have sufficient experience with six sigma, the assistance of external experts was highly needed during the projects. It is to be expected that external assistance will be similarly important in Lean.

The above experiences clearly show that health (hospital) care differs in many respect from industrial activities and, indeed, from the other services as well. The main reason for that is not that the patient is involved in the process, since that is equally true of the customers of many other services. The **distinctive feature is rather the complexity of the system, the difficulty of identifying the "customer" and the lack of identification of the "processes" and their lack of transparency.** It follows from the above that any development programme must take these characteristics into consideration. Moreover, for a development programme to be successful in the long run, it must be capable to interpret the system in a comprehensive way; to assess the role of every stakeholder, and to take into consideration the specifics of the system.

3.2.4. Lean transformation of hospital processes: General experiences and propositions (Young - McClean, 2008)

The last item of this literary review is the paper of T.P. Young and S.I. McClean. The British health care system and the lean initiatives of hospital there has been the research topic of Professor Terry Young for years. The article is about his experiences (but it does not describe the underlying systematic research), and it raises some quite legitimate questions based on the relevant literary sources. Therefore, I interpret the message of the article as expert opinion, not as fact based on empirical evidence.

This is how the authors sum up the effects of lean thinking on British health care, based on the experience accumulated at NHS and on Steven Spear's article presented above:

"*In summary, there is evidence of widespread familiarity with Lean, and accumulating evidence of benefit when it is applied, especially in the areas of safety, delay and cost-effective delivery of care."* (p.383.)

The subsequent "expert" comments of the authors, however, are of a more critical tone: in their opinion, development experts active in health care tend to propose to their clients the development methodologies developed by themselves, one essential element of which is, however, the PDCA[12] cycle, well-known from Deming. Later on, they go further:

"*The historical experiences of improvement methods applied in industry and in health care raises some concerns about the extent to which what is hailed as Lean is genuinely Lean in practice.*" (p.383.).

That is, these critical remarks point out that it is not clear what methodology, what bases are used for the implementation of developments labelled "lean". Since the methodologies of the various approaches are not known, one cannot draw generally valid conclusions from the changes induced under their effect. Let us note that these comments do not contradict the results of the Scotland-based research (Radnor et al., 2006) presented above; on the contrary, the two are in agreement to a certain point. Therefore, I shall take them into consideration in wording the research question.

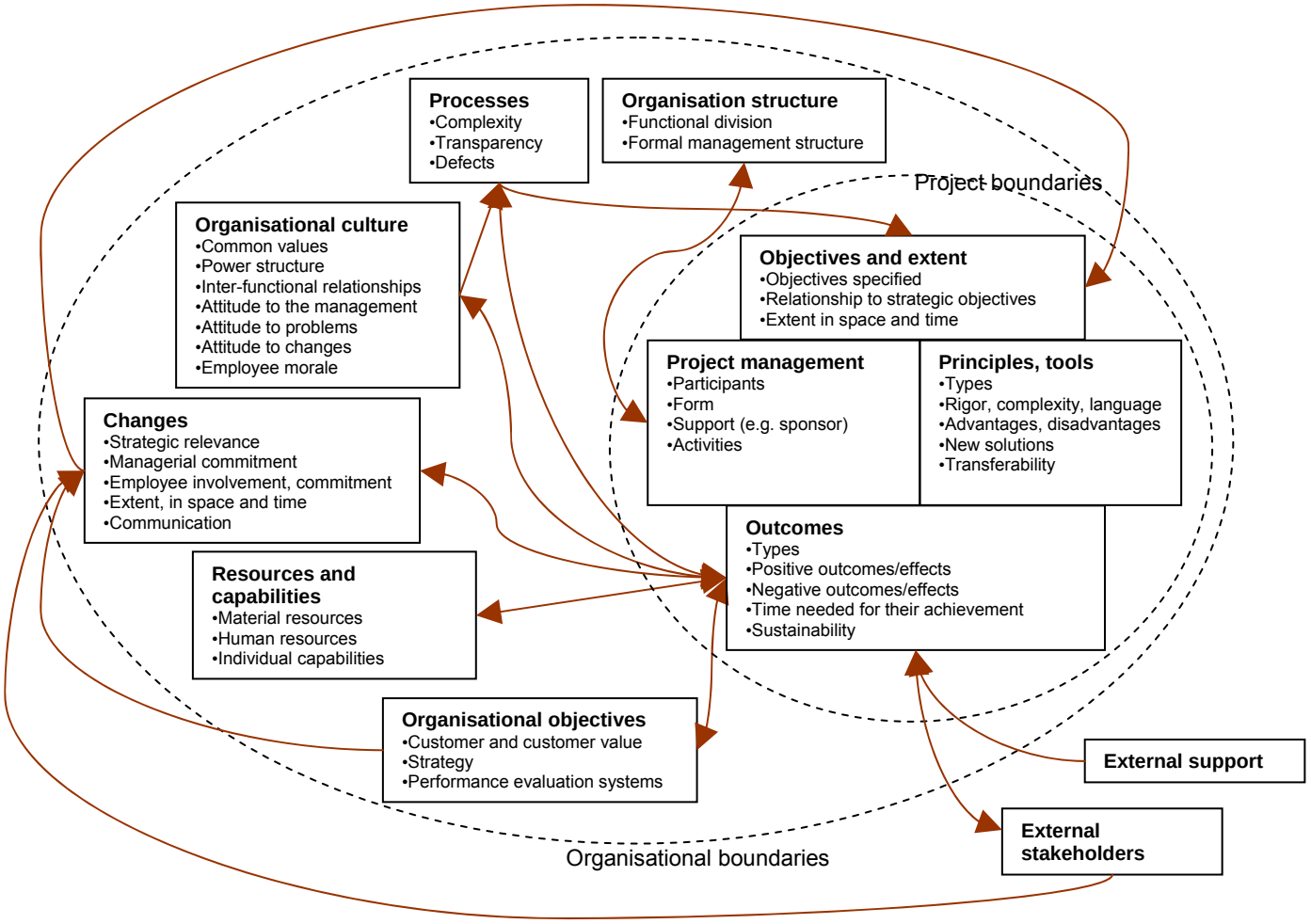
[12] PDCA stands for Plan, Do, Check, Act

Finally, in connection with a further critical remark, Young and McClean raise a highly important issue. The experience is that, in health care, the implementation of Lean is defined by consultants, on the analogy of their experiences acquired in industry or in other service branches. The key question, however, is their interpretation of the concept of "customer value", a key concept of Lean, in the context of health care. For, as compared with the industrial and the other service areas, in health care, value-type concepts such as "quality", for example, have several competing definitions (Young – McClean, 2008). The authors' concern is not exceptional: this question has been raised by several researchers who treat the lean transformation of health care processes (e.g. Burgess et al., 2009; Angelis et al., 2008; Kollberg et al., 2007).

3.3. The code system of the research

This section presents the picture provided by the analysis and synthesis of the contents of the four basic literature items, contrasted and supplemented with remarks and information from other writings related to the topic. The code system developed through the analysis of the basic literature items is shown in Figure 9.

Figure 9: Lean hospital processes: main factors, factor-categories and their interrelationship, based on the relevant basic literature items



Source: Figure compiled by the Author

That is, the system in Figure 9 is the "map" of the topics of the summary sources treating the lean transformation of hospital processes, and the higher-level topics to which those relate. It was produced through the observation of reality, i.e. induction. The figure gives an overview of those low-level codes that were made by the aggregation of labels given to all relevant information. Based on the nature of their content I call these the "factors of Lean". These factors could be than grouped into higher level categories, or "factor-categories". The interpretation and "further elaboration" of the categories produced by the grouping of the observations, on the other hand, allows to estimate the missing parts (deduction). That is, it can provide a point of reference for further researches to explore new correlations and virgin areas.

The "map", however, is far from complete: it is limited to the presentation of knowledge contained in the basic literature items. I am fully aware of the fact that, in addition to the categories indicated above, many others could be listed as well – partly depending on the point of view ever – and, indeed, the content of the individual categories could also be different. Furthermore, I must note that my business administration studies had a major effect on the development of the categories.

Since the model I outlined contains such wide categories as "organisational objectives", "organisational culture", which have their own schools of thought and significant technical literature, I shall not describe them in detail or explore their interrelationships here. In the current phase of the research, they are simply category labels used for structuring purposes, the contents and interrelationships of which will be deduced from the information content of the sources under study.

In what follows, I shall present the findings of the first phase of my research; the code system to be used for the structuring the information extracted from the cases. (see Figure 9.)

A significant part of information on the lean transformation of hospital processes in the literary sources condenses in the four categories in the centre of the figure: **lean objectives; lean tools; lean outcomes and management of lean projects**. To me,

these logically tightly bound four categories represent the practical manifestations of the lean transformation of hospital processes, i.e. **the lean project**. In the paper of Radnor et al. (2006), for example, this corresponds to the Rapid Improvement Event (RIE). The four categories are "backed" by several underlying factors – which I also assigned to categories –, which impact on the "projects" and their objectives, management, tools, results etc., i.e., the project itself. These factor-categories include, in my classification, the **hospital processes** with all their characteristics; the **structure of the organisation**; the **culture of the organisation**; the **organizational objectives** (i.e. the way in which "customer value" is defined); the hospital **resources and capabilities**; and the attitude to **change** and the manner of its treatment. Finally, I identified a third group of factors which includes the categories of **external stakeholders** and **external support**. The external stakeholders determine the objective and the circumstances of hospital operation (e.g. patient needs, financing systems, social expectations, objectives of the administration etc.) and the directions of and opportunities for development. The other factor category I identified outside the limits of the organisation is external support, i.e. mainly consultants. The latter may have even a direct influence on the planning and implementation of the changes. External stakeholders and external support are logically distinct from the other previously mentioned categories in that they are not intra-organisational factors.

In what follows, I shall present the above factor categories in detail. The order of their presentation matches the presumed logic of lean transformation. I discuss first the organisational objectives (definition of customer demand), and their manifestations. The objectives of the organisation are influenced by the external stakeholders, so this will be the category presented next. The decision concerning Lean as a programme of change originates from the gap between the objectives and the actual performance of the organisation, i.e. the process errors. The goals of the change must support the strategy. The programme of change is realised through specific projects. Thus the project objectives and limits are defined and then, with the help of project management and certain tools, results are achieved. The process, results of the projects are defined by the resources, culture, structure of the organisation and by external support.

3.3.1. Organisational objectives

The literature items under study did not discuss the organisational objectives (the mission). Strategy, on the other hand, is a concept which appears in all four writings, albeit the authors do not speak directly of the formulation of the strategy, but of the reconciliation of the objectives of Lean with the strategy. Since the strategy can be deduced from the mission, the super-ordinated objective must also exist. As far as our topic is concerned, "customer" and "customer value" deduced from the mission are the important point.

Many experts are of the opinion that the point of departure of Lean is the **exploration of "customer value"**. This is the first step of lean thinking (Womack – Jones, 1990). In health care, however, the interpretation of "customer" and "customer value" is not so trivial as in many other branches. This is due to the special nature of this service discussed in Chapter 2.3: the state of health of the patient and the outcomes of potential interventions are judged by the competent experts, but care provision is financed by a third organisation. The interests of the parties involved may be different, but neither is in command of all the pieces of information needed for making qualified decisions (Young – McClean, 2008). The four basic literature items assign different weights to this issue. Radnor et al. (2006) do not stop at the investigation of hospital cases, so the problem is not so prominent in their case. Proudlove et al. (2008) stress the importance of the issue, and emphasise that the apparently trivial "the patient is the customer" approach cannot be adequate in the long term. Young – McClean (2008) emphasise the necessity of providing a value definition which covers several aspects, on the ground that so long as we have no comprehensive image of the values, we cannot judge whether by reducing a certain type of waste we shall not create more waste elsewhere. Let me note here that, when presenting their own concept of Lean in health care, Womack – Jones (1996) clearly considered the patient the customer – that is, they apparently contradicted the theory of Young – McClean (2008).

Spear (2005) does not discuss the "customer value" topic directly, but it is clear from the project descriptions that they were initiated to eliminate "errors". Spear describes the case of LifeCare Hospitals in Pittsburg, where the rate of mortality due to certain types of infections was more than double the corresponding national averages.

Presumably, the hospital management decided to study and alter the processes to put an end to the professionally unjustified high infection rates and the related significant costs. The problem of objectionable professional performance is given considerable emphasis throughout the article so, presumably, this was also a significant motivating factor in the case described there. By adopting such an approach, these hospitals actually fulfil the requirements expressed by Young – McClean (2008), i.e. the errors concerned represent waste, i.e. they are contrary to the values, from the viewpoint of every stakeholder. Proudlove et al. (2008), however, warn us that this approach can only be effective in the short term.

Furthermore, Ahlström (2004) remarks that patient expectations can change and even the same patient may express different expectations in different situations. He proposes zero error as the target, since this is even more important in health care than in industry. Stevens (2002) quotes examples of the trend-like alteration of the patient-doctor relationship: thanks to the Internet, medical knowledge is no longer the privilege of physicians, but it is accessible to all, that is, the patient can develop his own opinion concerning his status and the therapy. In relation to this topic, Ahlström (2004) stresses that the interpretation of quality is different from what is commonly accepted in industry.

Angelis et al. (2008) report a general shift in favour of market-oriented operation and patient-centred care provision in the case of NHS, and they add that these principles are the rule only at private health care providers in the US and the UK. In the debate, they join the position of Young – McClean (2008) and Proudlove et al. (2008), and support their opinion by a detailed presentation of the relevant literature.

The evaluation of the realisation of the objectives is closely related to the objectives themselves. Hence the **performance measurement systems** are logically connected to this category. Radnor et al. (2006) highlight the negative effects of inadequate evaluation systems. Although not necessarily trivial to every hospital management, the field of business administration has made it clear that performance evaluation and the systems designed for that purpose are highly important for effectiveness (Ghalayini et al., 1997; Wimmer, 2002).

3.3.2. External stakeholders

The external stakeholders appear but indirectly in the articles. Partly in relation to the definition of "customer value" (interests) (Proudlove et al., 2008), and partly in connection with the external pressure which triggers lean transformation (expectations) (Radnor et al., 2006). In the case of British hospitals Praudlove et al. (2008) and Young – McClean (2008) also report on external pressure: lean transformation is one of the central ambitions of the British NHS.

3.3.3. Processes

The most frequent attributes of the processes in this context are "unstable" and "chaotic" (Proudlove et al., 2008), "complex, non-transparent" (Young – McClean, 2008), and, consequently, "full or errors" (Spear, 2005). The description of errors is a typical part of the papers on Lean (Leape, 1994; IOM, 2000; Tucker and Edmondson, 2003; National Audit Office, 2005; Brodt, 2006; Schenk, 2006; Kollberg et al, 2007, Williams et al., 2009). Spear (2005) attributes what he identifies as crucial errors primarily to the **complexity of the system**, which results in "unclear situations". In his opinion, a further cause of errors is that hospital workers seek new solutions when faced with unclear situations, instead of clarifying the situation itself. They tend to **bypass the problem,** that is, to find some other way to proceed with their tasks. Although they can satisfy the instantaneous needs of the patients this way, they do not resolve the problem which will therefore recur, and if they fail to react quickly enough on the next occasion, that may lead to tragedy. This is in line with the experiences of Ahlström (2004), namely that the service processes are typically not planned in detail, they simply "happen" (p.556.). The functional layout of hospitals is a related issue. In the opinion of Ahlström (2004), instead of the functional layout, which automatically requires the active or passive movement of the patient, a process-focused layout would be more advantageous. Mezőfi (2007) and Parnaby – Towill (2008) share his opinion.

Although not discussed in the basic literature, the reduction of change-over time belongs here as well. This is especially important in functions which require high concentration. Ahlström (2004) suggests that loss of concentration due to excessively frequent breaks could be eliminated by allocating an uninterrupted period of time of sufficient length to a given activity.

In regard of the process errors and their prevention, Ahlström (2004) explains that the materials, instruments and equipment play an important part in that. Consequently, the suppliers of these items are also significant. Given the participation of the patients in the service provision process, however, it is impossible to eliminate all errors, and measures must be taken to treat them (Ahlström, 2004).

3.3.4. Changes

To understand the changes, one must know the factors which trigger them and the obviously related "declared objectives of change" of the company. In the basic literature, Radnor et al. (2006) tackle these issues in an explicit way (see Table 4).

Although the paper is about Lean in the Scottish public sector, in two cases it obviously refers to forces compelling the health care providers to introduce changes:

- Lean is the result of a proposal which comes from the outside. This is the most typical case in general, and it is especially frequent among health care service providers (NHS).
- Lean is part of the implementation of a national strategy (especially in health care – NHS).

Table 4: Lean objectives of the organisations in the questionnaire-based survey of the Scottish research

Objectives specified by the organisations (105)	Occurrence frequency (no.)
Improve quality	20
Improve customer satisfaction	18
Reduce lead-time	17
Increase staff motivation	12
Reduce costs	11
Enhance flexibility	10
Increase decision-making potential of staff	10
Reduce workforce	3
Other	4
Total	105

Source: Radnor et al., 2006, p.119.

As for the objectives of lean transformation initiated under the effect of compelling forces, the interviewed organisations referred most often to quality development and improved patient satisfaction, improved process efficiency, enhanced staff motivation, and cost cuts (Radnor et al., 2006). The Swedish survey which asked a significant number of health care provider organisations about the reasons and manner of the developments seems to contradict the results of the British one (Jesper et al., 2003). The respondents mainly referred to inner motivation which was fuelled by problems in the work environment. The Swedish research, however, queried developments in general, not Lean development in particular.

The Scottish research (Radnor et al., 2006) identified two types of the Lean. One is **full implementation**. This essentially aims the introduction of Lean philosophy and the use of a wide circle of its tools. The design of the vision, the strategy is permeated by lean thinking, which then determines the operation of the organisation down to the lowest levels. The other type of introduction is characterised by the use of **rapid improvement events (RIE)** which produce fast results. In this case, the use of lean

tools targets waste elimination and quality development. Although this, too, is part of full implementation, it is applied at the tactical instead of the strategic level, mainly to ensure fast change and development in problem areas and to produce short-term results. Organisation heads often vote for the short development projects instead of the full implementation approach, due to the promise of immediate results. This, however, often implies a sacrifice of the long-term objectives. Radnor et al. (2006) indicate that, from the point of view of the sustainability of the developments, the experts clearly consider full implementation the more efficient of the two. These findings have been confirmed by a more recent survey of the NHS hospitals (Burgess et al., 2009).

The experiences and opinions which stress the necessity of the synchronisation of the scope in space and time of the changes to ensure an expedient allocation of the resources and to maintain operationality also belong here (Proudlove et al.,2008; Spear, 2005). Spear (2005) suggests that the changes should be gradual, lest they should interfere with service continuity, which means that the **changes are likely to be quite protracted**. **The complexity of hospital care may in itself lengthen the process of change considerably**. However, to sustain enthusiasm, it is important to have short-term targets and to celebrate their attainment (Kotter, 1995).

Protracted development is partly a characteristic feature of the proposed methodology and partly a result of the characteristics of health care. As for the spatial dimensions, according to Spear (2005), it is useful to start out on a small scale, that is, to observe the **principle of gradience** not only in terms of time, but also of the spatial scope of the project. Spear (2005) proposes to set up a "pilot line", that is, a unit where the solutions invented under the effect of the new approach can be exercised and tested. At the same time, a one-week rapid improvement event does not necessarily mean that you have to limit the size of the changes, only that you will implement them in small steps. A good example is Virginia Mason Medical Center, where according to Spear (2005) hundreds of RIEs were implemented from 2002 to 2005. On the basis of their analysis, Radnor et al. (2006) come to the conclusion that, although it is appropriate to start Lean in small steps, it is imperative to communicate to the stakeholders that what they see is part of a longer project, the final objective of which is lean operation.

Both Radnor et al. (2006) and Spear (2005) refer to the importance of the leaders' commitment to change and to the outstanding role of change-related communication, as well as to the necessity of the harmonisation of the endeavours to change with the

strategic objectives. Radnor et al. (2006) consider managerial commitment and support a precondition of the success of Lean. They consider equally important intra-organisational communication, the creation of a shared language of change, especially to ensure participation and commitment at every level of the organisation. According to the research findings of Radnor et al. (2006), the success criteria of Lean implemented in the public sector do not differ essentially from the factors needed for the successful execution of any other major change. This raises the question whether **the novelty in health care is the introduction of Lean or the implementation of change as such.**

Thus on the basis of empirical evidence, the basic literature items clearly vote for systematic developments, but they propose to implement them through a series of small projects. This approach ensures the hierarchical structure and long-term sustainability of the results – but it requires concerted and persistent efforts/activity for years in which the upper management must pay a key role.

In connection with the objectives of change, mention should be made of the experience of Grol et al. (2002), namely that several initiatives in health care have essentially the same objective, i.e. improved patient care. Apart from that, however, the initiatives differ in many respects: the approach, the object of the development, the level of control of the changes etc. Grol et al. (2002) suggest that there is not enough information on how the developments relate to one another, but it seems obvious that their results can only be sustained in the long run if they follow several approaches – simultaneously, or at least consecutively. Accordingly, it is commendable to review and take into consideration the various development approaches when selecting the development targets and the corresponding tools. The same line of thought is followed by Williams et al. (2009), who state that the isolated analysis of the problems cannot identify all the causes and, consequently, neither will the counter-measures have a permanent effect. For example, the inclusion of yet another check list may solve a problem, but if the staff are over-burdened anyway, it is to be expected that either the use of the check-list or the accomplishment of other activities will suffer some harm (Joosten et al., 2009). Therefore, it is recommended to view and analyse the problems systematically.

3.3.5. Project objectives and scope of the project

At project level, Radnor et al. (2006) mention two objectives in the hospital context: administrative change and planning application process. As for the objectives of Lean, the most frequently mentioned ones are quality improvement and patient satisfaction improvement, process efficiency improvement, enhanced employee motivation and cost reduction, in that order. The article by Spear (2005) does not explicitly list the objectives of lean projects, but the emphasis on care provision errors and output indicator value below the national average (e.g. mortality rate) suggests that the objective was to reduce these. In regard of the objectives, several authors stress their close connection to the strategic objectives of the organisation, a critical success criterion.

I consider the chronological and spatial scope of the projects, i.e. the definition/description of the area where change is implemented, to be closely related to the objectives. This issue is treated by both Radnor et al. (2006) and Spear (2005). As with the objectives, the strategic vs. tactical/operational dilemma is raised again. The authors all found that adherence to the strategic objectives and several shorter projects more effective than the other alternatives. As for the physical scope, Spear (2005) describes the advantages of the smaller-scale "model line" approach, which makes it possible to gain experiences without disturbing the operation of the complex system.

3.3.6. Project management

Both Radnor et al. (2006) and Spear (2005) tackle the issue of project management. They speak of project forms (e.g. team work), the composition of the participants (workers from several areas and levels), of support provided by the management to the project, activities through which it is implemented (e.g. initial training), problems it may cause unless the project objectives and their connection with

the strategy are clarified for the participants. Ahlström (2004), too, found it feasible to use team work in the health care area, although he stressed that the traditional daily ward meetings seldom provide an adequate environment for the developments.

As for the success of the projects, Radnor et al. (2006) list many factors which are usually typical also of projects of change. Thus they stress the importance of communication (make the objectives known, make the medium-level managers, too, understand the objectives of change, give the stakeholders an opportunity to express their opinion); of the availability of the necessary resources; the support of the related systems (e.g. breakdown of inter-ward barriers, transformation of performance evaluation systems etc.). In addition, they study the reasons of failure. In addition to the topics discussed among the success factors, they point out that leaving out key personnel not only deprives the project of an opportunity, but creates a chance for the persons concerned to turn against the changes, even if they would benefit from them personally. Therefore, voluntary application for project participation, although an advantage, may create a problem in some cases.

3.3.7. Applied principles, tools, solutions

The application of lean tools in the hospital context is one of the most frequently discussed topics in the relevant literature. This is logical in itself: the tools applied to induce change represent the basis of any transformation project. The topic itself is all the more prominent in the hospital context given the frequent arguments that, no matter what you do, the time-tested industrial solutions cannot be operational in health care due to the marked differences of the characteristics of the "products". Many authors share this opinion, but the opposite is also frequently expressed. Hence, understandably, this is priority issue, in the centre of interest.

From the four writings under study, that of Radnor et al. (2006) presents the area in most detail, including statistics of the application frequency of various tools. The

applicability of the two most frequently mentioned tools, i.e. elimination of the 7 wastes and process mapping and elimination of trivial deficiencies, is logical. The developments concerned, however, mainly aim at problem identification rather than problem solution (albeit the recognition of the essence of the problem often defines the solution as well). The tool "processes as experiments" mentioned by Spear (2005) functions in a similar way. Radnor et al. (2006) list many other specific tools as well. Speaking of tools, Young – McClean (2008) mention that although consultants apparently use different methodologies, the developments are usually implemented on the basis of the Deming cycle (PDCA). Furthermore, they ask the relevant – and so far unanswered – question whether the **tools applied under the flag of Lean actually belong to it**. Proudlove et al. (2008) express requirements concerning the project tools, based on the experiences of six sigma projects: take into consideration the wider correspondences; adopt a methodological approach, but beware of over-specification; use a language that is understandable to the participants; adjust to the competencies and expectations of the participants. Spear (2005) insists on the systematic approach. The essence of the methodology he proposes is precision on a par with that of scientific experiments. The tools, although frequently mentioned in the writings, are not examined from every relevant aspects, and it is rare, for example, **for the use of the tools to be described in detail***;* Spear (2005) presents some examples, but not all. **The delimitation of the scope of applicability of the tools is missing.**

Over and beyond the application of specific instruments, the technical literature often refers to the application of the "lean principle" of "lean thinking". Radnor et al. (2006), for example, stress that they generally encountered initiatives conforming to the five-step transformation process designed by Womack – Jones (1996). It is important to make a distinction between principles and specific tools, because the tools often generate aversion in hospital workers simply due to their industrial origin, whereas they find the majority of the principles acceptable (such as the 7 sources of waste). The conclusion that health care (hospitals included) should not only adopt the lean tools, but also adapt them to its own environment partly derives from this observation (Radnor et al., 2006).

The third component in the category is "Solutions". It is important that the tools we speak about are those that have been created in connection with the lean transformation of hospital processes, and have also been successful in the course of a project. That is, these new, occasionally health-care-specific solutions can be regarded as the hospital "mutations" of industrial lean tools. The description of the new solutions is again of an ad hoc nature, but it is encountered at some places (e.g. Spear, 2005). An essential question, tackled but not answered by the authors, is **what makes the new solutions applicable in and transferable to other hospital areas** (Spear, 2005; Radnor et al., 2006).

3.3.8. Lean outcomes

What we know most about is the outcomes of Lean, for, with only a few exceptions, almost every writing on the lean transformation of hospital processes discusses the lean outcomes. My four primary sources, too, mention the outcomes – albeit Proudlove et al. (2008) refer to the outcomes of the six sigma initiatives, not of Lean.

Spear (2005) reports a drastic reduction of hospital care and nursing errors in the cases known to him, e.g. the substantial decrease of the number of hospital infections. Moreover, the author refers to specific cases where the development objective was to eliminate problems of smaller relevance. Thus, for example, the reader can track the process of the specification of the blood testing operation responsible for the delay or cancellation of surgical operations at Western Pennsylvania Hospital's nursing unit for surgical operations/preparation. We can also observe the development of the circumstances of waiting for operations at the same place. These two examples clearly show which are the problems and "fuzzy situations", in addition to such obvious problems which threaten the patient (e.g. hospital infection) for the solution of which the author proposes certain tools. Delays in elective operations, for example, typically represent no danger to the health of the patient, but significantly reduce the organisational efficiency of the surgical ward, and hence increase the costs of the service provider. Similarly, lengthy waiting times in corridors of patients prepared

already for operation are rather "inconvenient", but imply no danger to the health of the patient and have no direct effect on the costs – but they impact considerably on the degree of satisfaction with the service.

Radnor et al. (2006) report similar outcomes, but the link between outcome/type of institution is not clear there. To illustrate the nature of the outcomes, let us quote some examples from the study: reduction of customer waiting time, of processing time, of the error ratio, improvement of work efficiency, reduction of staff and costs; prevention rather than error correction; spread of the continuous improvement approach etc. The outcomes they list are positive; they are on different scales, but almost always significant (improvement relative to the base rate always exceeds 10%).

Another question concerning is the outcomes is their relationship to the original objectives. Radnor et al. (2006) attribute the gaps between the envisaged and the actual outcomes to omission of the envisaged changes. They describe that as a barrier to Lean. The papers typically report exclusively positive outcomes, although it is not to be excluded that any intervention might have some negative effect on some performance feature. Elkuzien et al. (2006) propose the logical explanation that there are also less effective projects, but those are not the subjects of research reports. They urge to develop and use a more precise methodology in connection with this issue.

Between various factors there can be a negative correlation; when certain factors improve, others deteriorate. A good example is flexibility improvement in the context of lean transformation, concurrent with a drop in the degree of utilisation of the machinery pool. Therefore, it is fully justified to presume that the Lean has also negative effects and, unless they are known, one cannot have a full image of Lean. That is, **mapping the negative effects** is an important research area (Joosten et al., 2009). Radnor et al. (2006) remarks that **the projects which originally aimed at cost or staff reduction typically failed to achieve their aim.**

As for the scale of the outcomes, the time perspective of the outcomes is an open question. The descriptions usually include no indication of the period of time required to realise the given outcome. One can only make inferences based on the length of the project. Thus it is reasonable to surmise that the outcomes of changes implemented

during a one-week rapid improvement event manifest themselves after the termination of the project. However, the fate of the project following the one-week intensive phase is not clear. Are the envisaged measures implemented? Are the savings up to the pre-calculated level?

One of the central components of Lean, continuous development, and its outcomes, are presented in the paper of Spear (2005). In the given case, the hospitals produced significant outcomes by several series of measures. Although the article does not say so explicitly, it is to be assumed that the hospitals concerned have proceeded with the developments, to approximate the ideal state even more. A closely related issue is the *sustainability* of the results. Sustainability is linked to several organisational features, to be discussed later on (availability and quality of the resources, knowledge transfer, support of the senior management), and the close link or lack of it with the strategic objectives. Proudlove et al. (2008) also deduce the sustainability of the outcomes of Lean from the connection of the project objectives with the strategy. The researches of Radnor (2009) support the hypothesis that the sustainability of the outcomes depends of many other factors, but **organisational readiness**, related to the culture of the organisation, and the approaches applied during the changes, excel among them.

Another important question in relation to the outcomes is how to measure the improvements. In many cases, the solution is obvious, e.g. mortality rate (number of deaths / number of infected patients), but in others it is not, e.g. better understanding of the customers' needs (Radnor et al., 2006). If, however, we aim at a precise specification of the individual factors (e.g. to be able to explain their correlations), measurement will be a key issue (Ghalayini et al., 1997; Wimmer, 2002).

3.3.9. Resources ad capabilities

Radnor et al. (2006) mention the availability or absence of the necessary financial resources among the success criteria and also the barriers of Lean. **The biggest sacrifice demanded by a lean transformation project in the hospital context concerns employee time, not financial expenditures** (Spear, 2005; Radnor et al.,

2006). Spear (2005), who thinks this may be the pledge of the success of Lean, appreciates the competencies of health care employees, whereas Proudlove et al. (2008) emphasise that the six sigma methodology seemed alien and too complex in the hospital context, and the tools should be adjusted to the capabilities of the employees. Radnor et al. (2006) emphasise as a success criterion the capacity of the leaders to lead the changes.

3.3.10. Organisational structure

Organisational structure is apparently not closely related to the lean transformation of the processes. An analysis of the four primary sources, however, suggests the contrary: albeit none of the authors speak of a direct interconnection, there are many references to the existence of this relationship. Thus, for example, the complexity of the "system", i.e. the hospital organisation principles based on the differentiation and separation of the functions, and the corresponding **organisational structure** (Spear, 2005) are the main causes of the compartmentalisation of the processes and that, in turn, is a potential source of loss of information and delays between the processes. The author believes that the occurrence probability of "unclear situations" is enhanced by **thinking in terms of functions**. Although this is no problem in itself, but the absence of efficient function-integrating tools turns it into one.

Another factor of organisational structure is the **management structure**. The hierarchical distance of the senior management from the front-line workers is decisive for lean transformation, because this is what decides, partly, whether the former have an opportunity (and whether they feel the need) to learn about everyday practice, problems, the opinions of staff and patients. The many hierarchical levels cause detachment, complicate the flow of information and hinder change (managers at each of the levels have to be convinced separately) (Radnor, et al., 2006). The management structure describes where in the formal organisational hierarchy the employees and the managers who direct and implement, respectively, the planning and implementation of lean transformation are located, and what power they have. The bigger the power, the more chance it has to create the conditions of successful transformation. Spear (2005)

remarks in connection with this issue that Virginia Mason Medical Center has a special section to support Lean projects.

As for the further, related, literature items, Ahlström (2004) for example, found the decentralisation of responsibilities and the reduction of the hierarchical levels applicable and appropriate in the health care context. At the same time, he highlighted the problem of the parallel operation of professional and management hierarchies, which he thought could be solved by the integration of the administrative tasks among the daily tasks. He pointed out also the importance of the vertical flow of information and the institutionalised system of information sharing for lean transformation.

In a recent research concerning the application of process management in Swedish health care organisations, the researchers declared that the main hindrance to the achievement of process-oriented management was the traditional, bureaucratic, functional organisational structure itself (Hellström et al., 2009). However, they warned that the sudden replacement of the bureaucratic and functional system threatened with throwing out many of the previous achievements of the system, without having others in their stead. Finally, they stated that, as far as operationality was concerned, the ideal solution would be continuous transition from one system to the other, but in such cases the co-existence of the two systems generates significant internal tension.

3.3.11. Organisational culture

The culture of the organisation is one of the most prominent factor groups. According to Radnor et al. (2006), many components of what they call "organisational readiness" – a precondition of Lean which determines its effectiveness to a significant extent – belong here. Radnor et al. (2006) list among the barriers of lean projects e.g. the generally low propensity for change in the public sector, which may generate especially strong resistance to change on the part of management and staff alike. Further cultural elements, most important in regard of organisational readiness are the attitude

to problems[13], changes, novelties, respectively, and to functions (the capability of thinking in terms of processes and of working in teams). Over and beyond that, the process of lean transformation and its success greatly depends on the degree of coincidence of the values adhered to by the company and the values followed by Lean. Hence, for example, the role of the leaders (instruction vs. assistance), and the relationship between the different power levels (hostile vs. co-operative). According to the logic of the new, upgraded operation, **workers and leaders occupying a higher position in the hierarchy help those at lower levels identify errors and work out and implement new solutions** (Spear, 2005).

Spear (2005) also indicates several cultural factors (e.g. attitude to problems, errors; thinking in terms of functions; slow change; workers' morale).

In regard of NHS, Angelis et al. (2008) refer, generally, to resistance to change and the fact that the paradigm change due to lean transformation implies major challenges especially to workers who do not believe in the necessity and results of change.

The writing of Stevens (2002) on the correlations between the education of the medical staff and patient security is also related to the topic of organisational culture. His proposition essentially concerns the recent transformation of the traditional forms of medical treatment. He quotes the one patient / several physicians setup instead of the traditional one patient / one physician one, due to the higher level of specialisation. In his opinion, education has failed to adjust to the recent changes and, therefore, doctors are trained according to an approach that deviates more and more from the real needs: "*Complex systems, culture and team work are not central topics in the traditional curriculum*" (p.109.). Consequently, physicians adopt the views/attitudes of their teachers, and those do not match the new approach, that is, it is the education system that sows the seeds of resistance to shifts in favour of the new trends.

Davidoff (2002) calls the attention to a typical human factor of resistance to change, encountered (also) in the health care context: "…***the sense of shame seems to***

[13] Problem here means anything that prevents the workers from doing their jobs (e.g. lack of materials/equipment needed for care provision), or that may cause the deterioration of the state of health of the patient (e.g. undesirable events).

***be the 'shady side" of the developments. After all, the developments mean that however good your performance, it is not as good as it could be. Thus the sense of shame helps explain why the developments – which ought to be easy, a piece of cake – are nevertheless typically lengthy and sophisticated processes*"** (p.2.). The attitude-to-problems issue is touched upon also by Williams et al. (2009), who point out that some undesirable events, such as falls, for example, often happen in British hospitals, and the workers tend to see them as natural, inevitable, concomitants of hospital care. In their opinion, the underlying reason is that workers (especially the nursing staff) do a rope-dance to accomplish between several tasks of equal importance, and they discard some of the safety components of the activities step by step in the meanwhile. Since no one believes that it is possible to provide care so that such events never happen, there is a ready explanation for the gradual increase of the number of falls considered the stimulus threshold, without any objection to that. The authors suggest that persistent efforts are needed to change a norm of this type, established over long years, and emotional motivation could be part of these efforts.

3.3.12. External support

Finally, there is yet another important and frequently mentioned category, that of external support and supporters. Since few hospital workers have sound knowledge of Lean, external support is needed in almost every case, and it is almost inevitable in the first stage (Radnor et al., 2006; Proudlove et al., 2008). Young – McClean (2008), however, warn to be cautious with the tools used by consultants: it is possible that they are not suitable for the purposes of Lean and, tools taken over from industry are not necessarily the pledge of success in themselves.

3.3.13. Interconnections of the categories

Although I did my best to structure the pieces of information in the four basic literature items with the least overlap, there are nevertheless quite obvious interconnections between the categories. These are attributable to the interaction of their respective factors. This section presents interconnections made explicit in the writings under study, I indicated in Figure 7 by arrows between categories in the project and other categories. The strong interconnection of categories indicated within the project limits are symbolised by their representation side by side. The authors of the literary sources identified the following interconnections:

- Interconnection between the processes and the project objectives: the objective of the projects is to eliminate process errors. (Spear, 2005)
- Interconnection between organisational culture and process errors: Spear (2005) partly blames the culture which "bypasses" the problems instead of "solving them" for the errors committed in the processes.
- Interconnection between the objectives and scope of change and the objectives and scope of the project, respectively. The interconnection is obvious, as indicated by the arguments concerning large, comprehensive (full) vs. minor, step-by-step (RIE-type) projects (Spear, 2005; Radnor et al., 2006); where it is impossible to implement the change through one major project (in which case the change and the project would coincide), a major change must be realised in a series of minor projects.
- Interconnection between the external stakeholders and the changes: in the researches of Radnor et al. (2006), most of the motivations named by the researched organisations can be linked to an external stakeholder.
- Interconnection between the organisational objectives (mission, customer value, strategy) on the one hand, and the objectives and scope of the changes on the other: the importance of the alignment of the objectives of the changes and the strategy are emphasised by Radnor et al (2006), Proudlove et al. (2008) and also Young – MCClean (2008).

- Interconnection between several categories and the outcomes: Radnor et al. (2006) identified many of the criteria of "success", i.e. of the positive and sustainable outcomes;
    i. organisational culture (e.g. attitude to change, team work etc.) (Radnor et al., 2006),
    ii. changes (managerial commitment, communication, scope) (Radnor et al., 2006),
    iii. resources and capabilities (availability of) (Radnor et al., 2006; Proudlove et al., 2008),
    iv. organisational objectives (strategy, performance measurement systems, customer value) (Radnor et al., 2006; Proudlove et al., 2008),
    v. project objectives: projects which aimed at cost and staff reduction were not successful (Radnor et al., 2006),
    vi. project management (participants, support) (Radnor et al., 2006; Proudlove et al., 2008),
    vii. processes (because of the chaos, any tool may be effective initially, Proudlove et al., 2008),
    viii. external support (Radnor et al., 2006; Proudlove et al., 2008),
    ix. tools (specifically: Radnor et al., 2006; Spear, 2005), (systematic activity, complexity, language: Proudlove et al., 2008) (tools of value stream development: Young – McClean, 2008).
- Interconnection between the outcomes and several other categories: improvement was experienced in these areas under the effect of the projects:
    i. processes, e.g. simpler, faster course (Radnor et al., 2006),
    ii. organisational culture, e.g. prevention rather than error correction (Radnor et al., 2006),

iii. organisational objectives, e.g. better understanding of the customers' needs, development of performance measurement systems (Radnor et al., 2006),

iv. changes, e.g. enhancement of staff commitment (Spear, 2005; Radnor et al., 2006),

v. organisational structure: independent functions (organisational units created to sustain the outcome of Lean and to proceed with lean transformation) (Spear, 2005).

This chapter reviewed the categories highlighted and discussed by what I consider basic papers on the lean transformation efforts of hospitals. Of course, many other factors could be listed as well, but my objective was not to provide an exhaustive, all-embracing analysis of Lean, but to structure the available information. In what follows, I shall present information relayed by lean projects described as case studies, and explain how that can be fitted into the categories created in this chapter.

4. Findings based on the analysis of lean case studies

To map the experiences, I essentially relied on the technical literature accessible through the professional databases, supplemented with some other sources. The review does not aim at completeness and, given the high number of professional periodicals, some of which are not accessible to the researchers or accessible to a limited extent only, neither is it representative. Nevertheless, I assume that the examination of the case studies accessible through the professional database (EBSCO HOST/MEDILINE) and in the periodicals in the Central Library of Corvinus University, Budapest, will highlight the main experiences concerning the topic, their common denominators and any missing details. This chapter will analyse in detail only the sources which describe case studies based on specific development projects (whether identified as such explicitly or not) in sufficient detail for their content to be evaluated and compared to other cases.

As a first step, to identify the technical literature items needed for the exploration of experiences so far, I searched the EBSCO HOST/MEDILINE database based on the occurrence of the terms "lean production" or "Toyota" in the abstracts (http://web.ebscohost.com/ehost/results?vid=8&hid=106&sid=56ef0fe6-4330-4792-a18e-da496e363b72%40sessionmgr102&bquery=(AB+(+Lean+manufacturing+))+or+(AB+(+toyota+))&bdata=JmRiPWNtZWRtJnR5cGU9MSZzaXRlPWVob3N0LWxpdmU%3d 2009-02-28). The search produced 67 hits, including 35 articles related to my topic in the narrow sense. Of the latter, I processed 13 which described cases of hospital process development, "lean efforts". I supplemented the cases identified in the MEDILINE (health-care) database with others which, although originating from other sources, were comparable to the former in terms of content and scientific quality. Thus I could process a total of 20 case studies (from 17 sources; 17 locations) (see Tables 5 and 6).

Table 5: Interconnection of cases and sources

Venue/source		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		Appleby, 2002	Ben-Tovim et al., 2007	Braaten -Bellhouse, 2007	Fillingham, 2007	Furman - Caplan, 2007	Jimmerson et al., 2004	Kim et al., 2006	Laursen et al., 2003.	Nelson-Peterson and Leppa, 2007	New et al., 2008	Powell, 2009	Raab, 2006	Raab et al, 2006	Rosen, 2004	Shannon et al., 2006	Taninecz, 2009	Wessner, 2005
1	VA Medical Center in the Oakland section of Pittsburg, Pennsylvania USA	O																
2	Western Pennsylvania Hospital, Pittsburgh, Pennsylvania, USA	O																
3	Flinders Medical Centre, Adelaide, Australia		IR															
4	Porter Adventist Hospital, Dever, Colorado, USA			IR														
5	Royal Bolton Hospital, Bolton (Manchester) UK				IR													
6	Virginai Mason Medical Center, Seattle, USA					IR				IR								
7	Community Medical Center in Missoula, Montana, USA						IR											
8	LDS Hospital in the Intermountain Health Care System of Salt Lake City, Utah, USA						IR											
9	Park Nicolett Health Services (PHNS), Minneapolis, Minnesota, USA							IR										IR
10	University of Michigan, Ann Arbor, Michigan, USA							IR										
11	Skejby Sygehus (Hospital), Aarhus, Denmark								IR									
12	A special hospital in the UK										IR							
13	Akron Children's Hospital, Akron, Ohio, USA											O						
14	University of Pittsburg School of Medicine, UPMC Shadyside Hospital, Pittsburg, USA												IR	IR				
15	Toronto's Hospital for Sick Children, Toronto, Canada														O			
16	Allegheny General Hospital (AGH), Pittsburg region, USA															IR		
17	Mayo Clinic, Rochester, Minnesota, USA																?	

O – outsider ,i.e. the author of the article is an external observer

IR – insider research, i.e. the author of the article is a member of the researched (described) organisation

Source: Table compiled by the Author

In this phase of the research, I did not include sources which, albeit related to the topic, did not provide information of sufficient detail on the cases, thus, for example, the outcomes of the implemented developments. On the other hand, I did not exclude a single case on the ground that it did not report positive outcomes. As for the comments of the authors concerning the difficulties and problems of the transformation processes, I shall discuss them in more detail below, under the case analyses. The "other" sources referred to in the table are scientific (but not health-care-specific) databases, dailies, and

articles and conference materials of professional organisations/universities accessible to researchers on-line.

4.1. Characteristics of the institutions figuring in the cases

The majority of institutions in the cases is located in the US, dispersed in several states and countries. The United Kingdom figures with two cases, and Canada, Denmark and Australia with one each. The studies are usually about hospitals and clinics which, however, are of various types, sizes and business orientation (profit-oriented, not-for-profit).

The cases differ considerably in whether the development refers to a single process or sub-process, a problem or the entire hospital. They are similar, on the other hand, in that they generally concentrate on in-patient care. In several cases, the focus of Lean is the **intensive ward,** due to the importance of the temporal dimension, and the **operating theatre and the surgical ward** due to their significant cost implications**.** Another group consists of the development of the supportive processes (e.g. **pharmacies, laboratories, imaging methods, pathology**). Within the cases, the **administration processes** of patient admission and discharge are also touched upon. As for the contents of the developments, they **involve the medical/professional work process** (primarily in connection with the issues of standardisation and error-proofing).

The developments described in the cases started in the years following 2000 and several among them are in progress to this day.

Table 6 gives a brief summary of the cases by source, institution involved, measures and outcomes, in the order of the sources.

Table 6: Lean healthcare cases analyzed in the research

Serial no.	Source: institution	Characteristics of the institution	Application area	Developments	Outcomes
1	Appleby, 2002: VA Medical Center in the Oakland section of Pittsburg, Pennsylvania USA		Surgery (to reduce nosocomial infections)	Rubber gloves provided in each ward, in containers mounted on the wall, and appointment of a person responsible to monitor the stock; employee training; placement of new, non-soap-based hand-washing product by the side of the rubber gloves; visual marking of the "danger zone" (red line on the floor; mandatory hand-washing within that zone).	Increased willingness to wash hands; no infection case in the period under study (November to February).
2	Appleby, 2002: Western Pennsylvania Hospital, Pittsburgh, Pennsylvania, USA	non-profit hospital		Clarification of responsibilities; process standardisation; introduction of group leader position (task limited to prompt problem solving); use of a simple signal system before the last phase of the operation: the next patient can prepare; laboratory tests made right upon the admission of the patient, lest their lack should cause delays in the operations.	Reduction of patient admission time from 12-60 to 3 minutes; reduction of patient file compilation time from, a daily 9 to 2.25 hours; reduction of the number of patients in hospital gowns, waiting in the corridors, from an average of 4-7 to 0; reduction of the rate of deficient laboratory tests from 16% to 0; reduction of blood bank reports issued unnecessarily from a daily 10-11 to 0.
3	Ben-Tovim et al., 2007: Flinders Medical Centre, Adelaide, Australia,	500 beds, general non-profit teaching hospital	Emergency unit	Mapping of the trajectory of the patient during care provision; deployment of a new triage system: severe cases, in need of hospital treatment, are separated by the nurse from ambulant patients, who go home after treatment and the two groups are treated apart subsequently; cell-like organisation of care provision, adjusted to patient category and the care provision process, the cells provided prompt care to patients in their category.	The rate of patients exiting the ward without treatment fell from 7% to 3% of admitted patients; average patient time spent in the ward diminished by 48 minutes (from 5.7 to 5 hours).

4	Braaten - Bellhouse, 2007: Porter Adventist Hospital, Dever, Colorado, USA	Non-pro-fit hospital	Telemetry unit	Sketching of the care process (for patients and workers alike); before the developments, the sensitiveness of workers to "nonconforming conditions" was raised; the ideal conditions were defined, and described in terms of good/not good categories. The problems have been defined and their causes explored with the "**5 whys**" method; for material orders, the exact time and place of the demand was indicated in the computer.	The fluctuation of the nursing staff fell from 20% (October 2004) to 4% (July 2005). Productivity increased from 75% (October 2004) to 96% (October 2005); patient satisfaction rose from 3.9 (scale of 1-5) to 4.8 over one year.
5	Fillingham, 2007: Royal Bolton Hospital, Bolton (Manchester) UK	General purpose, non-profit hospital, 800 beds, 3,000 workers	Traumato -logy	The basis of the system is a change in culture, the instruments of which are one-week rapid improvement events, which implement the classical phases of planning/implementation/control over a continuous., seven-week cycle. Patient needs are understood via direct process observation, patient diaries, questionnaire-based and other interviews and focus groups. 5S. Detailed mapping of the patient trajectories. Re-design of process and area layouts. Development of a simplified documentation. Establishment of a visual management system. The Board of Directors assesses the changes on a continuous basis.	A 42 per cent reduction in paperwork; a reduction in the time taken to get patients into theatre with a fractured hip from 2.3 days to 1.7 days (a 38 per cent decrease);. total length of stay reduced by 33 per cent; and mortality reduced by 36 per cent resulting in a relative risk adjusted mortality rate of 105.5 (p.239)
6-7	Furman - Caplan, 2007; Nelson-Peterson and Leppa, 2007: Virginai Mason Medical Center, Seattle, USA	336 beds, 5000 workers, **for-profit**	general 27-bed telemetry unit	Signals to report and investigate cases which imply a threat; **Andon** signal: 24-hour 'hot line' / Lean programme and complex tools; rapid improvement events; one-piece (personal) flow; **"U" shaped cells** formed; application of **just-in-time (JIT); kanban**, standardised activities, supplies stored at the place of utilisation.	Elevation of the number of reports to avoid accidents from a monthly 3.6 in 2002 to a monthly 276 in 2006. / Stock reduction by 53%; employee efficiency improvement by 36%; reduction of floor-space by 41%; reduction of transit time by 65%; of distance covered by workers by 44%, of distance covered by products by 72%; of preparation time by 82%.
8	Jimmerson et al., 2005: Community Medical Center in Missoula, Montana, USA	non-profit hospital	several areas	Value stream maps prepared; separation of value-adding and non-value-adding activities; problem solution by using **A3 reports**; 7-week training of the selected employees.	Significant, medium-size developments in several areas of hospital operation, including cardiology, diagnostic laboratory, pharmacy and rehabilitation unit, invoicing, building maintenance unit.

9	Jimmerson et al., 2005: LDS Hospital in the Intermountain Health Care System of Salt Lake City, Utah, USA	non-profit health care service provider	intensive unit	10-week training programme of selected employees, error identification and elimination as part of it (based on **A3 report**)	Reduction of the delay of medication from 4 hours to 12 minutes; of the time of blood sugar level measurement; of the average delay due to the typing of the treatment instructions from 43 to 10 minutes; rise of the share of correctly kept patient cards by 60%; USD125,000 postage saved.
10-11	Kim et al., 2006; David K. Wessner, 2005: Park Nicolett Health Services (PHNS), Minneapolis, Minnesota, USA	non-profit hospital	Cancer centre; emergency unit; surgery, endoscope clinic (Methodist Hospital)	Lean principles applied; standardisation of surgical instruments; "**rapid improvement**" projects; precise mapping of journeys/trajectories of patients, workers, instruments, respectively, during care provision (e.g. standard supply trolley); visual signals designed to direct patients; surgery hours changed to avoid major fluctuations in patient numbers.	Number of CT and MRI examinations doubled at the previous resources utilisation level; the chemo therapy or antibiotics infusion capacity of the cancer centre raised by a daily 10 patients; waiting time in the emergency unit reduced from 122 minutes to 52; thanks to the use of standard surgical instruments, a monthly 40,000 less were used; endoscope examination capacity doubled.
12	Kim et al., 2006 University of Michigan, Ann Arbor, Michigan, USA	non-profit hospital	Peripherically inserted central catheter (PICC) team	Precise mapping of the trajectories of patients, workers and equipment, respectively, during care provision; process analysis, search for development opportunities (for the sake of the most precise timing of the placement of the catheters); insertion of a helper staff member into the care provision process who prepares the necessary instruments, accessories etc. for the qualified nursing staff, to reduce thereby the burdens on the professional staff; standard procedure introduced to request X-ray examination and to deliver that to radiology, and standard method to evaluate the photographs to simplify writing based on dictation."	In 3 months in a row, 90-95% of PICC (catheters) was placed within 24 hours starting from the request; 36% decrease in the average time of catheter insertion; 50% reduction in the number of reports requested from radiology.

13	Laursen et al., 2003. Skejby Sygehus (Hospital), Aarhus, Denmark	Non-profit general-purpose and research hospital	Cardiac surgery, preparations for by-pass surgery	Mapping of the steps of the preparation process; separation of value-adding, non-value-adding activities from the patient's point of view; process re-design.	Reduction of the waiting time from 6.5 to 4.5 hours (by 31%); number of patient movements dropped from 4 to 1 (by 75%).
14	New et al., 2008: a special hospital in the UK		Surgical emergency unit	Workshops to employees; process map preparation training; several mini projects; type "**5S**", initiatives to ensure order, cleanliness in the hospital wards; selection and systematic arrangement of materials, medicines, instruments in the cupboards, drawers; new rules for patients: restriction of non-urgent phone calls to certain periods of time; error-proof **(poka-yoke**) solutions to provide for the accessories, medicines needed for the recovery of the patients; process re-design, visual signals introduced; supply trolleys redesigned; several orienting white boards re-designed, , provided with the photos of the responsible nurses, and colour armbands provided to nurses responsible for the wards.	Early results: rate of patients provided TEDS [thrombosis embolic deterrents] with success and accurately rose from 35% to more than 90% on average.
15	Powell, 2009: Akron Children's Hospital, Akron, Ohio, USA	non-profit hospital	Sterile operating theatre	One-week "**rapid improvement**"; observation of the process of the cleaning, sterilisation and transportation of instruments; demolishment of half of a partition wall to ensure better visibility; signposting, to make the destination of each delivery clear to workers; daily assignment of workers to activities instead of having one person make all assembly as well as delivery.	Significant capacity increase (the potential maximum number of surgical operations rose from the previous annual 13,000 to 16,000); the hospital spent some $248.000 on consultants and staff training, but savings due to the first 28 projects in the first year is estimated at $708.000 in addition to a significant amount of time.
16-17	Raab, 2006; Raab et al, 2006: University of Pittsburg School of Medicine, UPMC Shadyside Hospital, Pittsburg, USA	non-profit hospital	Pathology (Papanicolaou test and thyroid FNA diagnosis)	Check-list introduced for each step of the Papanicolaou (Pap) test; in the cytological laboratory, samples were processed and evaluated one by one; standardisation of expressions used to evaluate the thyroid FNA diagnosis.	Reduction of the proportion of difficult-to-evaluate samples in the Papanicolaou (Pap) test from 9.9% to 4.7%. Drop in the rate of erroneously evaluated tests from 9.5% to 7.8%. For thyroid FNA, the rate of results wrongly identified as negative dropped from 41.8% to 19.1%.

18	Rosen, 2004: Toronto's Hospital for Sick Children, Toronto, Canada	non-profit hospital	Radiology	Standard protocols designed, which specify the professional activities, the necessary instruments, and time needed for the accomplishment of the activities. Minimum/maximum supply levels defined, for individual items as well as larger units. The medical image processing unit set out to analyse the contracts concluded with the suppliers of its equipment to reduce maintenance costs, through the more precise monitoring of the real use time of the equipment.	Under the effect of the altogether 10,000 measures taken over 4 years, the calculated cumulated savings alone attained $140,000.
19	Shannon et al., 2006: Allegheny General Hospital (AGH), Pittsburg region, USA	778 beds, university health care centre 4,600 workers (1,250 doctors)	Intensive care unit (ICU)	For central line–associated bloodstream (CLAB) infections, detailed examination of the infection cases, one by one (frequency, type, outcome); observation of the work practice of the employees; prompt detailed investigation of the circumstances of newly occurring cases, exploration of the root causes; application of new processes as a result of the analyses.	Within a year, the number of CLAB infections fell from 49 to 6 (from 10.5 to 1.2 infections /1,000 line-day); mortality fell from 19 to 1 (from 51% to 16%), despite the growth of line days. The results prevailed for 34 months.
20	Taninecz, 2009: Mayo Clinic, Rochester, Minnesota, USA	2,400 doctors/ researchers; 30,200 workers 500,000 patients annually	Cardiovascular Health Clinic: (CVHC)	The workers surveyed the current state of affairs; they reviewed the entire patient care process (time of activities, waiting times, first-round quality); they introduced patient risk analysis in client admission; they developed a standardised protocol for the processes of diagnosis and evaluation and intervention, in view of the established policies. They set different standards for patient groups with different risk ratings (including the specification of the role of every participant). They designated free time in the various test schedules, to make it possible for CVCH patients to make the echocardiogram and the stress tests on the same day, if need be. They introduced shared positions for appointment makers and clinical assistants, which reduced the number of the necessary administration corrections, improved communication and employee satisfaction.	The rate of cancellations and absent patients shrank from 30% to 10%; CVCH could fix an appointment during the first call with 90%; thanks to the more precise time-schedules introduced around the medical staff, the utilisation of the time of the doctors rose from 70% to 92%. Results from the point of view of the patients: drop in the number of steps from 16 to 6; growth of average time of doctors spent with patients from 241 to 285 minutes; drop in waiting time for preliminary medical consultation from 33 to 3 days! The rate of availability of materials, instruments, information etc. needed for the completion of the prescribed tasks rose form 5% to 65%.

Explanation of the technical terms in the table:

- **5 Whys** – A problem-exploration tool: in view of the answers to question querying the roots of the problems, the question is reiterated. The tool helps explore the root causes.
- **5S** – Five Japanese words starting with S, which, as a system, provide for order and cleanliness at the workplace. (1) **Seiri:** Sort. Separate needed from not needed. (2) **Seiton** Straighten. A place for everything...(3) **Seiso** Shine. Clean and wash. (4) **Seiketsu** Standardise. Build into accepted routines. (5) **Shitsuke** Sustain. Discipline to ensure maintenance.
- **A3** report – Process development/problem solution tool, named after its form. Filling in the fields in the form stimulates the systematic work of the person filling it in, and due to its systematic layout, the problem and the solution algorithm is easy to understand also for laymen.
- **Andon** – A visual signalling system at the place of manufacture, usually a display mounted at an elevated point, which indicates the status ever of the production system and indicates the problem to members of the group.
- **Value Stream Mapping** – This technique essentially provides a graphic display of the process of the creation of the product, which shows the entire process and its main features in one figure. The value stream map is the basis of process planning.
- **Just-in -Time** – Organisation principle designed to ensure that the appropriate unit be received at the appropriate time and in appropriate quantity.
- **Kanban** – A standard signalling system (card or a recipient), TO TRIGGER ACTION which authorises the upstream process step to do the activity assigned to it. Without the signal., however, the activities must not be performed.
- **Poka-Yoke** – A "fail-safing" or "mistake proofing" tool, to eliminate product defects during order fulfilment or manufacture.
- "**U" shaped cell** – Named after the layout of the production area: the equipment/instruments needed for the accomplishment of some activities are concentrated and arramged in U-shape there, to enable workers to cover a shorter distance to get back from the last one to the first.
- **Rapid improvement event –**Usually problem-solving activity carried out in a small group and limited to one week, the objective of which includes practical implementation.

Source: Table compiled by the author.

4.2. Method of case analysis

For reasons of space, Table 6 provides but a brief description of the cases, and I shall only describe a single case in such detail as I applied to note the cases down when I collected material for the analysis (Table 7). The other cases have also been analysed in the structure shown in Table 7, with as many details as allowed by the source.

The example to be presented here in detail is the result of a conscious selection process; a relatively detailed report is available to researchers on the efforts and achievements of Royal Bolton Hospital (Fillingham, 2007), the author of which is no other but the head of the institution. Another advantage of the example is that it concerns a general hospital active in Europe, within the national health care system. Hence albeit the case itself allows no generalisation, it helps avoid the pitfalls due to excessively specific features (e.g. profit-oriented operation, service focused on a single area, special status, research site etc.).

Table 7: Short presentation of the case of Royal Bolton Hospital

Institution/ Research period / Source	Royal Bolton Hospital, Bolton (Manchester), UK 2005-2007 Fillingham, D. (2007): "Can lean save lives?", Leadership in Health Services, Vol. 20. No. 4, pp. 231-241.
Features of the institution	General hospital, 800 beds, 3,000 workers
Area involved in the case	Traumatology
Initial deficiencies	"Historically there have been serious concerns in Bolton regarding mortality, productivity and morale within this service. The hospitals' length of stay for fractured hips was higher than the national average. The service was prone to cancellations of surgery and at times felt chaotic. Despite many attempts at improvement using clinical audit and other approaches the problems remained. Most worryingly of all mortality rates were high. The relative adjusted risk of mortality for a fractured hip in Bolton in 2004/2005 was 173.9, in other words over a 70 per cent higher than expected chance of a death from this condition. (p.234.)
Applied tools	To adapt Toyota's tools, the hospital set up its own process development system, called Bolton Improving Care System. The basis of the system is a change in culture, the tools of which are one-week rapid improvement events, which implement the classical planning, implementation and control phases during a continuous seven-week cycle. The tools described below are part of these one-week projects: To understand patient needs, direct process observation, patient diaries, questionnaire-based and other interviews and focus groups are used. "By using 6S … by cleaning every part of the workplace …to ensure that peace and orderliness become part of everyday work." (p.235.); "Nurse Managers at ward level are encouraged to regularly look at their wards with fresh eyes to spot the waste and

	potential for harm to patients. Each week they are asked to identify at least three problems. They then work with their staff to identify and implement solutions before tackling a further three problems the following week. (p.236); They were taught the method and then put it into practice by mapping in detail the progress of the patient's journey from arrival at A&E through radiology, the wards, theatres, back to the wards and the discharge process. In doing this they found enormous waste, error and duplication…" (p.236); "…From a low point early in the week when they fully understood all of the problems the team moved to develop an exciting vision of how the service could be in the future. That future state was made challenging but achievable and pitched some 12-18 months into the future. Finally the team ended the week by developing an improvement plan to deliver their future state." (p.237.); "The team redesigned the area to create a trauma stabilisation unit in which the sickest patients were received and stabilized medically prior to theatre. A good flow was then established to allow quicker access to theatre, proper rehabilitation and effective multidisciplinary team working after patients had had their operation. A single set of much reduced paperwork was created for use by medical staff, nurses and therapists alike eliminating much of the form filling that had grown in an ad hoc way over the years …" (pp.237-238.); Finally, visual management systems were set up so that staff could see on a continuing basis whether or not the process was operating as it should and what quality problems and defects were occurring." (p.238.); „…the Executive Board (made up of directors and senior clinical leaders which meets once a month), now considers all of the previous months lean improvement activity, checking that the expected results have been delivered and asking questions as to why if they have not." (p.239); „by trying to find a way to regroup efforts to provide for the colleagues the time and resources they needed to participate in BICS [Lean] …" (p.240.)
General outcomes	"… we had a much clearer understanding of what was truly valuable to patients." (p.235.); "This has led to fewer clinical incidents, fewer medication errors and higher staff morale" (p.236.); "…a culture where looking for and solving problems is the norm rather than simply working around them…" (p.236.); "This greatly reduced the number of non-value adding steps and alleviated a large source of staff dissatisfaction and frustration." (p.238); Furthermore: smoother co-operation of multifunctional groups; faster patient recovery and lower demand on the rehabilitation ward following operation; restored financial balance; significantly reduced waiting lists and a crystallised vision of the future.
Specific outcomes	"A 42 per cent reduction in paperwork; a reduction in the time taken to get patients into theatre with a fractured hip from 2.3 days to 1.7 days (a 38 per cent decrease);. total length of stay reduced by 33 per cent; and mortality reduced by 36 per cent resulting in a relative risk adjusted mortality rate of 105.5" (p.239).
Difficulties, experiences	"All too often hospitals are so cluttered and untidy it is hard to see where the waste is, and almost impossible to create a smooth workflow." (p.235.); "… standard work should be what we have in the past termed effective clinical practice. The trick is not just to identify it but to embed it so it is carried out consistently on a daily basis.." (p.237.); " We have found that the key is to be clear at the outset about aims whether these be for reductions in mortality, improvements in productivity or increases in patient satisfaction.." (p.238.); "Unless line managers fully own the rogramme of work and are committed to implementing the changes and sustaining them on a continuing basis then gains made during the heady days of a rapid improvement event are likely to be quickly lost.. … We have learned that it is vital for senior leadership to show a genuine interest in this work and pay attention to the results that are being delivered." (pp.238-39.); " In other parts of the hospital where BICS has been applied, similar successes have been achieved. In pathology there has been a reduction in floor space of almost 50 per cent which has allowed the Trust to bring in new work at a fraction of the expected cost. The routine sample processing time in the blood sciences area has reduced from an average of five hours to less than 60 minutes. … The pathology department has increased its income by 10 per cent in the last year with 2 per cent fewer staff … Similarly in the laundry the productivity improvements have been impressive." (p.239); " To date the laundry has generated almost £300,000 worth of savings and additional commercial income using its lean

	approach." (p.240); "In the long term however it is clear that the BICS approach is a sustainable way of achieving targets and financial balance whilst at the same time improving staff morale and patient satisfaction.." (p.240.)

Source: Table compiled by the Author

I treated the descriptions found in the international literature described in Table 6 as research cases based on secondary sources and I processed them accordingly. The use of secondary data has the advantage of making otherwise inaccessible data relatively easy to access to the researcher (like myself), while providing relatively ample information. On the other hand, it is a major drawback of secondary data/observations that one cannot alter the scope of data, and the precision and relevance of the observations is not necessarily clear and cannot be corrected in retrospect. There is no opportunity to ask questions to clear what are seen as obscure points. Thus one can only learn about the real events through the thoughts, words of others. Without knowing the underlying motives of the authors, it is difficult to assess the extent and direction of occasional data distortions. In the present case, the situation is improved by the following: (1) the case descriptions are addressed to the professional public, and hence the authors probably did their utmost to express their message clearly and (2) most authors were actively involved in the developments, that is, they could provide as precise a description of the events as if they had been interviewed. In Table 5, I marked with "O" for 'outsider/independent, external observer' the writings where the events were reported by a person who was not a member of the development team or was not directly concerned in the operation of the organisation. In contrast, I marked with "IR" for 'insider research' descriptions based on first-hand experience. As can be seen in Table 5, in 4 of the 20 cases, the author was not present when the changes took place, and in one case it was not clear whether he was. That is, in 15 of the cases, information was provided by eye-witnesses.

I applied the code system developed through the processing of the literature to the cases, to analyse their content and classify the data. This gave me an opportunity to connect the pre-defined labels (i.e. the lean factors) and categories to the texts, the specific examples originating from the cases. My objective was to place the empirical evidence in the "space" defined on the basis of the literature items presented in detail above, to get a picture of what factors were emphasised and how these related to the pre-defined factors. During the coding, I tried to identify the text parts (a word or even a paragraph) which conveyed some definite idea by the factors identified previously. In

some cases, this was not possible; I then supplemented the previous factor set with new factors. I shall present these "new factors" in the section on the outcomes.

After the coding process, I reviewed the data, cleared them of typing mistakes, classification errors, misinterpretations. In doing so, I related the labelled text segments to their original context and its classification, and I also related them to other text segments in the same category. This resulted in the final placement of polysemantic texts or texts with underlying contents. I made consistent efforts to grasp the real content of the texts, and to abstract from the possible underlying meanings which could depend strongly on the person doing the interpretation.

I then studied the results at two levels: at an aggregate level, mainly on the basis of quantitative features. I examined the occurrence frequency of each factor, and drew conclusions from that. These conclusions represented the basis for the development of the comprehensive image.

The other level of examination was the study of the content of the text parts assigned to the factors. The goal was to specify the distinctive features of each category and to identify interconnections between the categories. During the content analysis, I compared the text segments to other text segments in the same category, to obtain a picture of the specifics of the category. The table I designed allowed me to see other text parts assigned to the same category and also the connection between the given text part and other categories simultaneously.

4.3. Results of the analysis of descriptions of Lean cases

This section presents in shortly the results of the analysis outlined in the previous section. Here I first present the quantitative distribution of the text parts assigned to the codes and the conclusions they offer. I refrain from the detailed presentation of information associated with each factor; instead, I shall connect them to "further experiences" under the synthesis of the research results in Chapter 7.

4.3.1. New factors identified during case processing

The processing of the cases studies revealed some parts in the texts the contents of which did not match any of the factors in the space created during the processing of the basic literature items. (Thus, for instance, it seems obvious to me that references to employee morale belong to the category of organisational culture, but it is not identical with any of the factors listed there already.) Since, however, the parts concerned were relevant for our topic, I decided to add new factors to the original ones to preserve the information they contained. I identified three further factors during case processing, these are:

- In the category of "project management": "motivation of the participants";
- In the category of "organisational culture": "blaming culture", and
- also in the category of "organisational culture", the factor of "doctors' independence".

In what follows, I shall apply these factors in the same way as the original ones.

4.3.2. General image projected of Lean by the quantified coding results

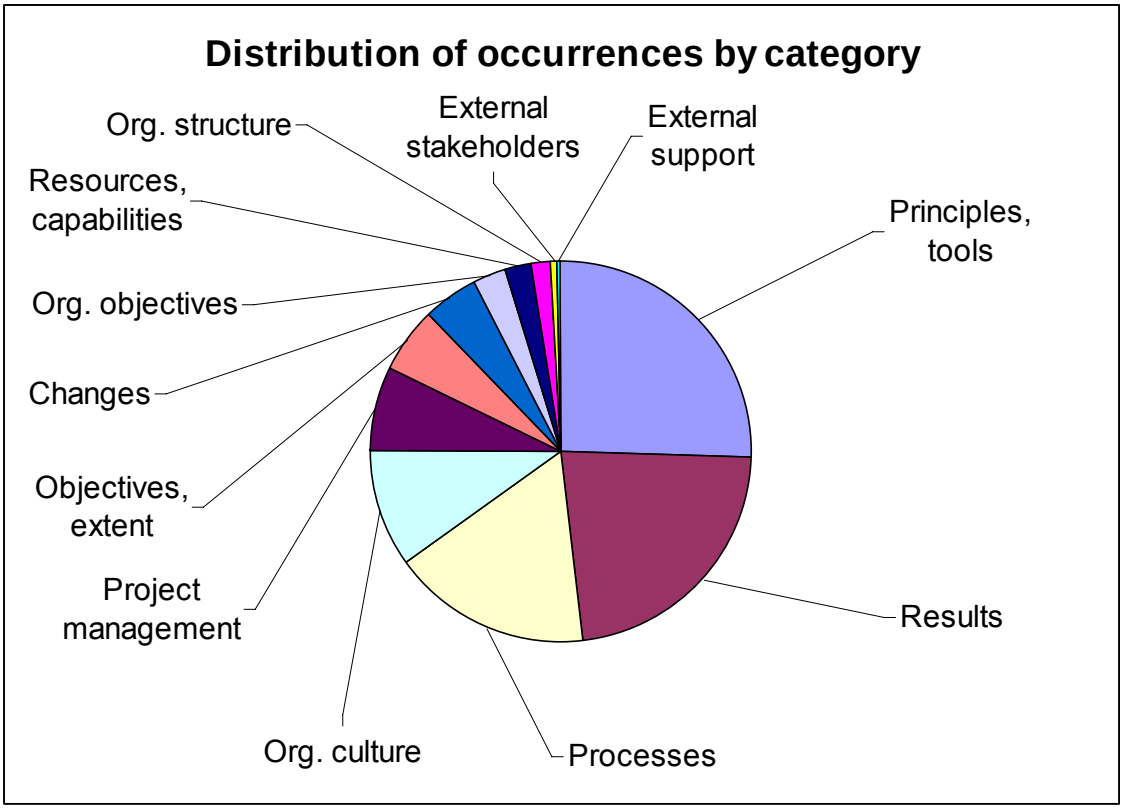
First of all, let me sketch the general picture projected by the occurrence of the factors/categories based on the primary literary items in the case descriptions. It was assumed that the occurrence frequency of text parts assigned to a factor is indicative to some extent of the significance attributed to the factor by the author in the context of lean transformation. 725 occurrences in the cases were linked to 41 factors. Table 10 shows the distribution of all the occurrences by category. As shown by the figure, the authors of the case studies paid most attention to the tools and outcomes of Lean. These two categories absorbed almost half of all occurrences. Another frequent topic was the presentation of the processes and their deficiencies. It is a surprising but all the more expressive fact that the fourth largest category was that of organisational culture. That was followed by project management, then the categories of project objectives and the more general context of the changes. Organisational objectives, resources and

capabilities, organisational structure, external stakeholders and external support made up the rear.

Category size offers some quick conclusions: the case studies focus on the problems (processes) which call to life the lean projects, the tools and the outcomes. Organisational objectives (strategy) and external stakeholders do not play a significant role. This circumstance seems to decide the local objectives vs. strategic changes debate in favour of projects to promote local objectives in the projects under study. The low occurrence of references to the resources and to organisational structure also suggests that (i) the projects were not significant enough to exert an essential influence on these issues or (ii) the goal of the authors was not the analysis, but only the description of the facts. In the light of the above, the relatively significant weight of the category of organisational culture is all the more noteworthy. The question of organisational culture was probably such an emphatic issue during the projects that it could not be disregarded or left unmentioned.

After the review of the rank order of the categories, let me proceed to a more detailed analysis of their content: the weight carried by each factor. Figure 10 shows the occurrence frequency of references to each factor, in decreasing order. I used the "**outcome types"** label the most frequently in the 20 case descriptions. The authors of each case description gave special emphasis to listing the outcomes of the lean efforts. This is understandable in itself, considering that this is about applying a way of thinking/arsenal of tools to a new area, in spite of the fact that their applicability had been questioned by many. That is, to decide the issue, the lean outcomes must be described. What may be more surprising, however, is that 116 of the 123 references speak of **positive** outcomes, that is, the authors (do not forget that most of them were also participants of the lean projects) **experienced almost only positive outcomes in the projects they observed.** This finding – a surprising one which raises the suspicion of the researcher – is worthy of further analysis, but right away let us proceed with our fast review.

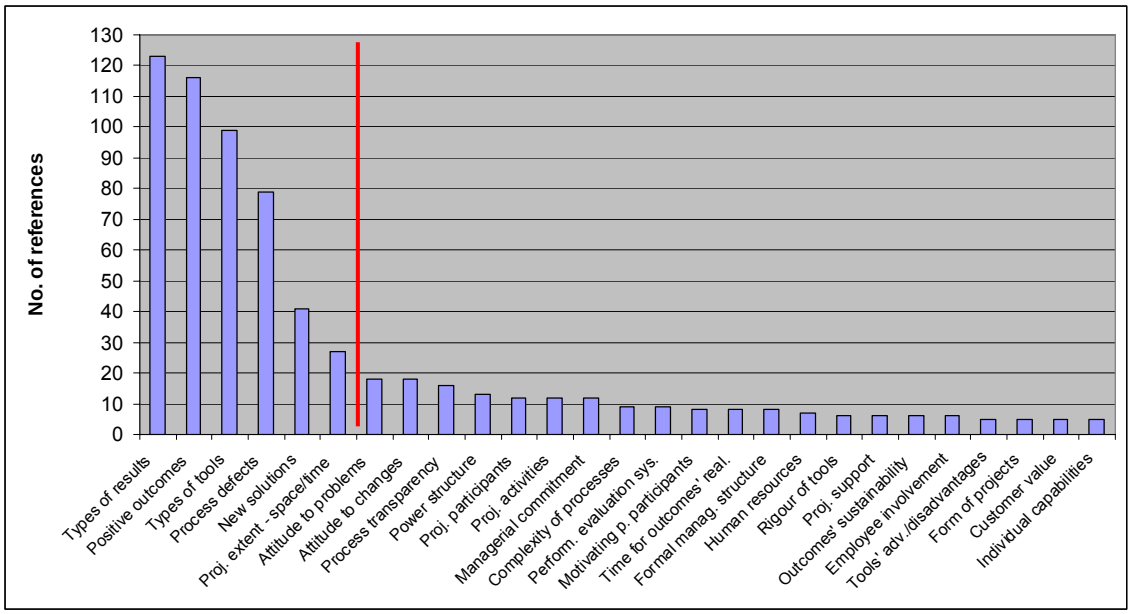
Figure 10: Distribution of occurrences by category



Source: Figure made by the Author.

The second most frequently mentioned topic after the (positive) outcomes is the presentation of **lean tools** (their types) (99 references, 17 sources), and the presentation of **process defects –** the explicit or implicit causes of the lean initiative – which carries almost the same weight (79 references, 16 sources). This is followed by the **detailed presentation of** health-care-specific **tools, solutions** applied during the projects**.** In terms of the number of references, the next item in rank order is a mandatory element of case descriptions: that is the description of the **project venue**. These are the six factors mentioned with significant weight; the remaining ones were mentioned less than 20 times each. It is nevertheless striking that in the list the 7th and 8th place is taken by two factors related to organisational culture: employee attitude to problems and changes. The factors mentioned at least five times are shown in Figure 11, and those mentioned less than five times are listed in Table 8.

Figure 11: Most frequently mentioned lean factors in the researched cases



Source: Figure made by the Author

Table 8: Factors mentioned less than five times and their occurrence frequency in the analysed cases

Factor	No. of references
Negative outcomes	4
Objectives specified	4
Transferability of the solutions	4
Doctors' independence	4
Project scope (in space/time)	4
Project objectives related to strategic objectives	3
External stakeholders	3
Functional distribution	2
Shared values	2
Interrelationships of the functions	2
Blaming culture	2
Employee morale	2
Institutional strategy	2
Material resources	2
Strategic significance of the changes	2
Communication of the changes	2
External support	2

Source: Table complied by the Author.

This section presented the conclusions offered by case coding, based on the frequency of references to the factors. The following one describes the results of the

analysis of the contents associated with each factors, and it will also offer tentative answers to some questions asked above.

4.4. Summary of the results of the examination of Lean cases

The experiences of the foreign cases will be discussed in detail in Chapter 7; this is only a brief summary of the results of the analysis.

In summary, the cases suggest that hospitals do not consider Lean a strategic programme of change as yet. The number of positive outcomes, on the other hand, seems to indicate that the absence of the strategic approach has no negative effect on the results of lean projects (at least not in the time perspective under study). This, however, is contrary to the message of the basic literature items (Radnor et al., 2006). The contradiction might be resolved by the proposition of Proudlove et al. (2008) and Young – McClean (2008) that the management of hospital processes is in such an embryonic stage, it struggles with so many deficiencies, that any development approach would produce success in the short term.

The few authors who do discuss this topic fully agree on the importance of the commitment of the management and of its demonstration. For, this is what determines the opinion and commitment of the staff. Further ways to ensure staff commitment are to involve them in the projects and to give them an opportunity to acquire positive experiences.

As for project management, the works of some authors project the image of **team work as it is known from the industrial applications of Lean, with its typical participants, steps and supporters. The importance attributed to the involvement of the medical staff is a special feature.** We shall compare that to the PDCA approach.

5. Lean transformation of health care processes in Hungary: possibilities and pitfalls

Chapter 4 presented 20 lean cases implemented in various parts of the world, mainly by health care institutions, hospitals, university and private clinics, with special regard to their background, tools, outcomes and lessons. This chapter will present the situation in Hungary. First it gives a brief description of Hungarian health care, limited to what is absolutely necessary in order to understand the research context. Then it proposes some arguments to support the Author's opinion that the theory and practice of Lean is by and large unknown to the representatives of health care in Hungary, with only a few exceptions.

5.1. The health care situation in Hungary[14]

It is not the objective of the dissertation to present in detail or assess the general situation, problems and reform ambitions of Hungarian health care. Therefore, this chapter will be limited to the most essential pieces of information needed to understand the context of the research described afterwards.

The transformation of the Hungarian health care system started with the change of the economic and political regime. Its services, previously available on citizen's right, became conditional on an insurance relationship based on contribution payment *"…Since 1996, every Hungarian resident Hungarian citizen is entitled to the in kind health services of mandatory social security, to the extent justified by their state of health. … as a matter of fact, from preventive care to rehabilitation care, every health care service is part of the insurance system."* (Borbás et al., 2005, p.33)

[14] Source of information presented here: Borbás et al., 2005.

The health care system is financed mainly from public funds; private expenditure is estimated to represent 20-30% of all costs. The largest segment of the public funds concerned is generated by the health care contribution payment of employers. The Health Care Fund reimburses the operational costs of health care institutions in municipality ownership from the collected funds through the National Health Insurance Fund (Hungarian abbreviation: OEP). The municipalities must provide for the health care of the population. They fulfil that obligation as owners of the institutions concerned: the maintenance costs of the latter are debited to their account. As for the patients, care is, in principal, provided free of charge, but they have to pay for example for medicines and therapeutic aids.

Free care provision is concurrent with the institution of gratuity (parasolvency), which was estimated at HUF 40.6 billion in 2002.

The first level of health care is the family doctor service, the objective of which is to realise the principle of free choice of doctors. Nevertheless, the decisive majority of family doctor services has territorial care provision obligation. Family doctors are financed through the performance-based "card system", proportionally with the number of patients provided care.

Out-patient care is provided mostly by hospitals, despite the contrary intention of the authorities at the head of the reforms. Specialised out-patient care provided at nursing institutions is financed on the basis of the tasks, whereas general out-patient specialised care, imaging diagnostics is financed on the basis of performance. The latter system is based on a score system defined by intervention type. OEP pays the institutions the counter-value of the aggregate care performance scores.

In-patient care has three levels: the urban hospitals, located at max. 25-30 km from the place of residence of the patient, operate only the basic units. The next level is that of county hospitals (and several Budapest-based hospitals), which function, for certain specialities, as regional centres. From a professional point of view, the highest level is that of national institutes and university clinics, which have national competence in their specific areas. The current expenditures of the hospitals are financed by OEP, and their maintenance costs are borne by the municipalities. The hospitals are provided performance-based financing, according to the so-called System of Homogenous Disease Groups in effect since 1998. The introduction of the latter had the negative effect of escalating hospital performance. The introduction of the institution of volume limit introduced in 2004 was meant to harness that escalation.

The hospital have been subject to several waves of transformation to reduce central budget expenditure on health care. In 2006, the number of beds was reduced significantly and several hospitals were closed down to offset the excessive hospital-centeredness of the system.

In 2007/2008, the government made act in order to partially privatize the health assurance system (Index, 2007). However the act was withdrawn due to the intensive social resistance (FN.hu, 2008).

5.2. Status report on the lean transformation of health care processes

Lean and lean healthcare are almost unknown concepts to Hungarian health care professionals to date[15], except for a few institution heads and interested professionals who learned about them on their own initiative. This statement is confirmed by several circumstances:

- One of the bastions of health care manager training, the Health Care Manager Training Centre of Semmelweis University, does not provide training in this area (they teach quality development/TQM); no theses are written on the topic.
- No mention is made of Lean (Lean, Toyota system, etc.). in a book on clinical efficiency written by several prominent health care personalities, edited by no less renown professionals (Gődény, 2007)
- With only a few exceptions (e.g. Baur, 2006), the Hungarian health management periodicals publish no articles on the topic.
- For the managers of Zala County Hospital and of András Jósa Teaching Hospital, Nyíregyháza, both of which excel in the area of quality development, this represented a "fresh" topic at the ISO 9000 Forum Conference held in 2008.

[15] Research associated with the dissertation started in Summer 2007; some progress could have been made in the meanwhile in the introduction of lean management.

- The health management professionals I met during the research knew of no Hungarian health care institution applying lean management a systematic way.

Of course, the above are signals rather than clear-cut evidence, but there can be no doubt as to the backlog of the application of Lean in Hungary relative to what is the vanguard of the world in this respect (USA, UK).

Let us note, however, that health care is being developed along several lines, by several initiatives (e.g. quality development (Gulácsi, 2000), efficiency development (Gődény, 2007), six sigma (Topár, 2006; Tóth, 2009), some of which could be linked to Lean, although this has not taken place yet.

6. Presence of lean factors in the operation of a Hungarian National Quality Award winner hospital

This chapter presents the case of Zala County Hospital, the other cornerstone of my research, and the results of its analysis. That is, I contrast the picture based on the basic literature items, coloured by information obtained from the 20 foreign cases, with the experiences of the development efforts of a Hungarian hospital.

With the above, I have a twofold objective: (1) to complete and deepen the understanding of the international experiences – through the detailed knowledge of the circumstances of a concrete case ; (2) to assess the generic relevance of the international experiences. If the international experiences are typical also in the Hungarian context, then we have probably identified such general models as may be typical in a very broad circle. The aim of this research, however, is to present the phenomena, not to go into the underlying explanations; further research will be needed to determine the causes and scope of validity of the characteristics identified here.

6.1. General presentation of Zala County Hospital (ZMK)[16]

The section gives a short description of the hospital and the main features of its operation.

Zala County Hospital looked back on a past of 161 years in 2009. Its current owner is the Municipality of Zala County; its direct patient care area is the town Zalaegerszeg and its surroundings, and the town Lenti and its surroundings but, if

[16] The presentation of the hospital is based on data displayed on its website at www.zmkorhaz.hu on 30 September 2009.

necessary, the hospital receives patient also from beyond these areas. The 1700 employees of the hospital treat an annual 37,000 cases at 20 in-patient departments (1270 beds), and 1 million cases at more than 100 specialist consultations. Eleven central diagnostic, therapy and central care provision units contribute to patient care. The hospital provides care in line with the traditional medical professions and beyond, e.g. in the form of internal medical care, surgery, neurology, psychiatric care, gynaecology, paediatrics, orthopaedics, dental/oral surgery, ophthalmology, STROKE Centrum, intensive child care unit, Cardiology and Cardiac Surgery Centre, to satisfy the complex needs of the inhabitants of the area within its competence.

To ensure the continuous improvement of the quality of health care, Zala County Hospital has been looking for and applying the most up-to-date management principles such as controlling and quality assurance since the early nineties. In 1995, the hospital was certified by the Austrian Association for the Certification of Quality Management Systems (ÖQS) according to ISO 9001. The hospital operates development teams in several areas (internal medicine, surgery, diagnostics, nursing, background areas) to improve its quality management system.

The institute is also the teaching hospital of several institutions of education (Pécs University of Medicine, Imre Haynal University of Health Sciences and Zalaegerszeg-based Ferenc Deák Health Care Vocational Secondary School). In 1997, its 2nd Internal Medicine Department won the title of WHO Clinical and Demonstration Unit.

The quality development performance of the hospital is excellent, as witnessed by its honours and prizes:

- 1997: IIASA-SHIBA prize
- 2003: Special Prize of the Western Transdanubian Regional Quality Prize of the Chambers of Commerce of Counties Zala, Vas and Győr–Sopron
- 2006: National Quality Award, Public Service Provider Category – it was the first health service provider which received the award.

6.2. Research methodology

This section provides a brief description of the selection criteria of the Hungarian case; the criteria of information collection and processing and the criteria and process of the information processing phase.

6.2.1. Justification of case selection

As mentioned already in connection with the Hungarian context, lean management has not been part of hospital practice in the country. As an earlier Hungarian research have shown, the in-depth research of Lean in the hospital context is only feasible if the researched organisation is ready to adopt the lean approach, that is, it has already mastered a process-based approach at some level and it is open to change (Jenei et al., 2008). The interrelationship of TQM and lean management provided sufficient ground to invite to the research a hospital which obviously applies the TQM approach, thus shows the necessary readiness to absorb these concepts. Therefore, I visited the two hospitals which won the National Quality Award. The reason why I included in the dissertation the results of research carried out at Zala County Hospital was that, in the time of the finalizing phase, they seemed to project a more comprehensive picture of the hospital. Note, however, that Zala County Hospital and András Jósa Teaching Hospital, Nyíregyháza, are highly similar in many respects.

The case of Zala County Hospital is not about the application of lean management in the sense that the managers and employees of the hospital do not use this term to identify their process development efforts. The hospital implements actions to enhance patient satisfaction, to increase patient security and process efficiency and to create a balanced business management through the tightly integrated systems of quality management, quality development, TQM and controlling. On the basis of its performance in 2006, the hospital won the National Quality Award, the declared objective of which is to recognize the activity of Hungarian producer and service

provider companies/institutions in the vanguard of the application of the TQM approach.

That is, the case of ZMK is actually about the application of Lean in the hospital environment in the sense – and for my research, this is the decisive point – that the philosophy (ISO-compliant quality management and quality development based on the TQM approach) and tools conform to a significant extent to the Lean philosophy and tools (Jenei, 2009). This is demonstrated, firstly, by what was said in Section 1.4 on the close relationship of TQM and Lean. Secondly, the hospital applies in a systematic way several components of the lean tools described in Section 1.3 and defined by the empirical research of Shah – Ward (2007). Thirdly, the nature of the development projects implemented by the hospital fits clearly among the developments discussed in the 20 previous cases.

6.2.2. Methods of data collection

I used several methods to collect data on the operation of the Hungarian Zala County Hospital to reduce the chance of having to work with significantly distorted data (Voss, 2002). I relied on the following data sources:

- I used the National Quality Award (ZMK-NMD, 2006) application material, evaluated at the time by an independent committee which carried out on-site verification of the pieces of information in it and examined the operation of the hospital. In view of the latter, I accepted information contained in the application as genuine. I took no steps to evaluate them myself.
- I made interviews with the hospital managers, the current Chief Managing Director (Dr. Irén Csidei) and Quality Manager (Dr. Katalin Kránitz) and the deputy of the latter (Ilona Bognarné Laposa), and, furthermore, with the former Chief Managing Director (Dr. József Várszegi) and Medical Director (Dr. István Rubecz) the former Quality Manager (Dr. Mariann Tihanyi) and the current Operating Theatre Matron and a surgeon.

- During my personal visits, I reviewed the quality manual of the hospital (MIKK) and the documentation of the TQM projects.
- I used the thesis of the Chief Managing Director and of the Quality Manager submitted to the SE Health Manager Training Centre, and the articles published on the hospital and its employees in scientific periodicals, as well as information displayed on the hospital website, and the contents of conference presentations held by the employees of the hospital.
- I inspected the operation of the hospital on site.

The interviews took place between November 2008 and April 2009. I contacted the interviewees by e-mail and I made appointments on the phone. The interviews took place, with a single exception, on the hospital premises. They lasted for 37 to 72 minutes. I had conversations with the Chief Managing Director on two occasions. Those interviews lasted for a total of 6 hours and 20 minutes.

I began the interviews with a short introduction of myself, the topic of the research and the objective of the interview. Then I asked a question expressed in general terms that the interviewees could answer freely. I asked 2-3 similar questions during the interview, adding a few clarifying questions if that seemed necessary. The questions addressed to the former and current hospital heads queried how the TQM approach was adopted and introduced in the hospital and what their relevant experiences were. The second line of questions targeted the forms of the manifestation of efficiency and economical operation during the developments.

The operating theatre matron and the surgeon were asked to speak freely about their daily tasks and the requirements set by the hospital to them.

I classified information collected during the research according to the code system created on the basis of the analysis of the articles regarded as basic literature items, shown in Section 3.2. I compared the pieces of information so arranged with the results of the research of the international cases. This has promoted by deeper understanding of some factors related to the development of the hospital processes and made it possible for me to paint a more precise picture of the possibilities and limits of Lean. Moreover,

the comparison provided a point of reference to judge with phenomena can be regarded as being generally characteristic and which are attributable, in all probability, to the health care system of the given country or to a specific hospital setting.

6.3. Lean and the related factors in Zala County Hospital

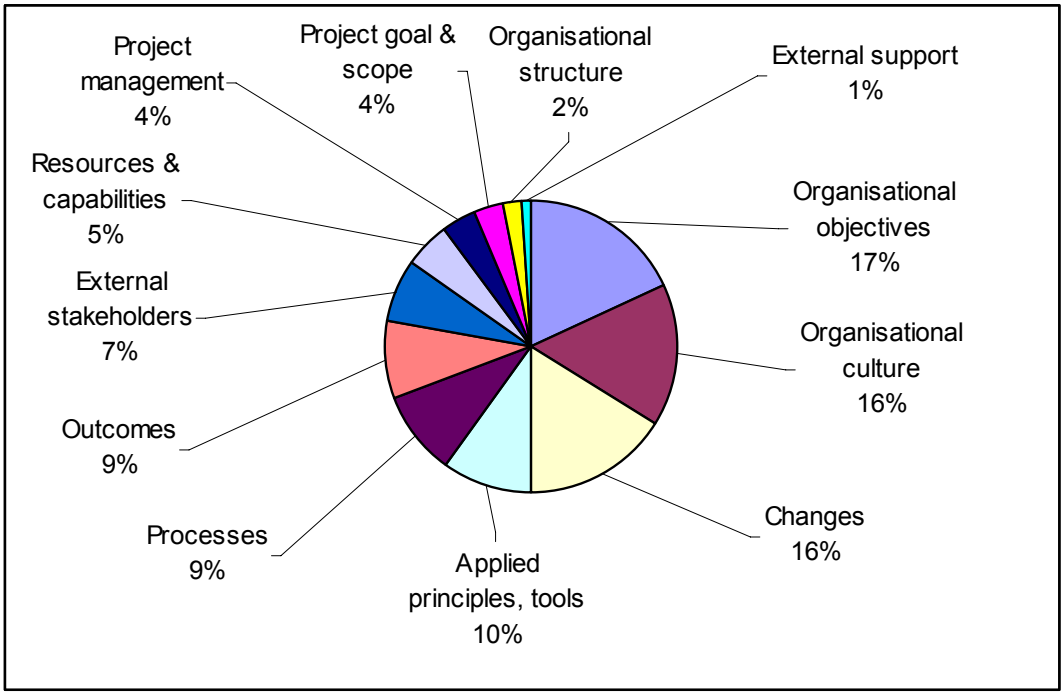
This section presents the results of the analysis of the quality development experiences of ZMK according to the code system which I set up on the basis of the basic literature items on Lean in health care. First it gives a brief description of the numerical distribution of the coded text parts (references), then it presents each factor in the order used at the introduction of the code system.

6.3.1. General image of the developments based on the quantified results of the coding process

Before the detailed presentation of information by category and the conclusions they offer, let us discuss the numerical distribution of the coded text parts by category. This will provide something of an overview of the nature of information concerning the lean efforts of ZMK.

Figure 12 shows the distribution of references by category. Although it is not prudent to draw far-reaching conclusions form such a simple statistic – arrived at, partly, under the influence of the interview questions –, there are nevertheless some prominent shifts in emphasis relative to the content of the case studies analysed previously.

Figure 12: Distribution of statements concerning the developments implemented at ZMK, by category



Source: Figure made by the Author.

As we shall see, the most prominent areas indicated in the figure are typical of the way of thinking of hospital managers and of the communication of the hospital in general. Hence both organisational objectives – the mission and the vision of the organisation – appear not only in the quality management manual (MIKK), but also on the hospital homepage (www.zmkorhaz.hu). The three largest categories – organisational objectives, organisational culture and the changes – contribute exactly half of all references. This proportion (although the datum is "for your information only") confirms my impression that the hospital management is committed to the application of TQM, the basis of which is the strategic approach, the "total" application of its principles – i.e. their presence also at the level of organisational culture –, and continuous development (changes). The proportion of references to external stakeholders, higher than in the previously discussed cases, should also be linked here: this, too, confirms the presence of the strategic approach.

In comparison with the case descriptions presented above, it is also noticeable that the hospital information sources assign less emphasis to the tools. Of course, this may have several causes, but I am of the opinion – partly due to information to be presented below – that this is attributable also to the fact that **the ISO and TQM methodologies**

followed by the hospital give much less guidance concerning the actual tools than the lean literature. The figure also shows that ZMK's information sources project a more balanced picture of the developments, their context, than the 20 cases analysed previously. This feature justifies the inclusion of the case in the research and enhances the reliability and validity of the latter: the **more prominent presence of the strategic approach and the more balanced presentation of the various factors is an excellent addendum to the picture distorted previously by the excessive emphasis on the tools and the outcomes.**

6.3.2. The objectives of the organisation and the external stakeholders

In the 20 cases shown above, I missed the text parts reflecting the strategic approach and the presence of a long-term perspective. ZMK is a completely different case. The objectives of the organisation are repeatedly stressed in both the interviews and the other sources (NMD application, quality management manual – MIKK, website etc.).

All three factors in the category of organisational objectives are frequently mentioned by the interviewees, moreover those are mentioned in other sources also. This suggests that the issues of "customer", "customer needs", strategy, and the systems responsible for the measurement of the implementation of the strategy carry a significant weight also in the everyday life of the hospital.

The hospital management identified the patients as customers of the service: "*ZMK considers the patient its primary customer.*" (ZMK-NMD, 2006, p.35). Many of the hospital measures beyond therapy in the strict sense, such as extensive information provision within the hospital and through the media (concerning the operation of the hospital, patient rights, rules of the house, news services etc.), the employment of a representative of the patients' rights and of a social worker to handle complaints, the patient satisfaction surveys, the survey of the state of health of the population, the adjustment of new services to the needs of the population, the establishment of patient

clubs etc. are designed to satisfy their needs and ensure their satisfaction (ZMK–NMD, 2006).

The mission statement displayed also on the hospital website also focuses on the patients and the population serviced by the hospital:

"The mission of Zala County Hospital is first and foremost to provide efficient health care, institutional care to the population of Zala county and to preserve their health. Therefore, we assign special weight to the diagnostics and efficient therapy of the diseases which affect the population of the county most….We take part in prevention and screening, programmes to propagate healthy living; we keep in touch with the partner organisations and other social organisations." (ZMKorhaz.hu, 2009/a)

At the same time, as indicated also be the above quotation, the hospital management is clearly aware of the role of further stakeholders of its operation: "*We have gone through that several times ... We mention more customers or stakeholders, from OEP to the maintainer – the municipality, the license provider – ÁNTSZ, the National Public Health and Medical Officer Service, the referring physicians – from the family doctors through the hospital in the other urban hospitals ...*" (Tihanyi, 2009, p.2).

The hospital consciously manages its contacts with the other external stakeholders. It submits monthly performance reports to the financier (the National Health Insurance Fund Administration – OEP), which OEP in turn confirms on a monthly basis. It provides training to the family doctors and carries out systematic surveys of their opinions. It makes efforts to maintain close professional contacts with the hospitals of the area, the home nursing services, the institutions of education: *" …The head physicians provide professional supervision to urban hospitals within the county, they take part in professional lecture courses. …We have established close co-operation with the institutions of education to in the interest of the replacement of professionals*." (ZMK-NMD, 2006, p.23.) Supplier management is regulated as well: "*The procurement department operates a supplier qualification system. Suppliers are selected jointly with the user areas, the product/service specifics are defined jointly."* (ZMK-NMD, 2006, p.24). Furthermore, the hospital set up foundations and associations. It deems the nurturing of its contacts with the public organisations important, because this is how it can acquire information of relevance for its operation

(state of the population, expected measures etc.), to support professional work (ZMK-NMD, 2006, p.24).

The former vision provides a good summary of how the hospital management intended to realise its mission[17]:

"We want to become the leading hospital of the region through our efficient curing activity, by ensuring patient satisfaction, the economical and efficient operation of the institute, supported by the most up-to-date management tools and methods." (ZMKorhaz.hu, 2008)

This reveals what the management considers the objectives of operation:

- efficient curing activity
- patient satisfaction
- economical and efficient[18] operation
- application of the most up-to-date management tools
- to become a leading actor in the region.

That is, **in addition to patient satisfaction and quality professional work, the hospital aims at excellence also in other areas of operation; in terms of the applied management tools and operating efficiency (economical operation).** I think that this fact has played a significant role in the achieved successes of the hospital[19].

The declared objective of the strategy designed by the hospital is to satisfy the explicit needs of the patients (cf. patient satisfaction surveys) as well as their implicit needs (e.g. professional tasks due to the demographic and state-of-health characteristics

[17] A renewed vision was released by the hospital in Spring 2009.

[18] Efficiency here refers to operational efficiency, whereas in the above it referred to the efficiency of medical therapy. It is useful to distinguish these two concepts: the efficiency (or effectiveness) of medical treatment is determined by the degree of health improvement which can be attained by the method being used. Operational or technical efficiency, on the other hand, is determined by the relationship of expenditures and outcomes. Consequently, a given method may be effective but not efficient, and vice versa. For more information on the topic, see: Evetovics, Tamás - Gaál, Péter (2003): "How effective is cost-effective? – How the name of an analytical method became an independent efficiency concept", *Egészségügyi Menedzsment*, March-April , pp.74-81.

[19] The centres of gravity of the renewed vision of the hospital are somewhat different from the old one: "lead role" is replaced by "recognised" and "decisive actor", "economical and efficient" by "economically stable" and, to my great regret, the *"most up-to-date management tools"* have been omitted from the statement. This shift in emphasis is probably attributable to the drastic changes of the Hungarian environment.

of the area provided for), and the requirements set by the financier are also taken into consideration.

"*... during the creation of the strategy, the management takes into consideration the care provision area and consumer market of ZMK, its operating environment and its effective financing agreement. It analyses the demographic data of the area to be provided for on a continuous basis ...*" (ZMK-NMD, 2006, p. 10.).

In addition, they try to set the long-term development directions in consideration of further environmental factors: "*The hospital considers it important to nurture contacts with the public organisations, to obtain information which is essential for its operation (state of the population, expected measures etc.)*" (ZMK-NMD, 2006, p. 24). This philosophy has been adopted by the management also at the level of everyday operation: *"… if there is an initiative at the ministry, we do our best to be there, ...* „ (Tihanyi, 2009, p.2.)

Although the hospital management designed strategies in previous years as well, those usually summed up objectives, developments and measures envisaged for the following year:

"…the management holds an extended strategic/co-ordination meeting once a year, to define the operational strategy of the organisation for one year." (ZMK-NMD, 2006, p.13.).

In the spring of 2009, however the hospital management decided to upgrade strategy-making, and as a result, they succeeded in working out a more complete strategy than before:

"*We have invited an external consultant ..., because it was felt that we cannot really bring together the strategy and the objectives and the implementation ...*" (Csidei, 2009/b, p.2.)

There are several fora at the hospital to monitor target fulfilment. These are reviewed in Table 9. Target setting and fulfilment is supported by an indicator system and by controlling statistics. The controlling system was deployed simultaneously with the introduction of the quality insurance/quality management systems.

Table 9: Fora to assess target realisation and their frequency

Performance evaluation forum	Frequency
Executive meeting	Weekly
Management audit	Annual
Professional management body meeting	Quarterly
Matrons' meeting	Quarterly
Department meeting	Quarterly
Daily department meeting	Workdays
Quality Management Council	Quarterly
Committee reports	Annual
Staff satisfaction survey	Annual
Medical consultation	As necessary
Internal quality audits	Annual

Source: ZMK (2006) and Csidei (2009/a)

At the weekly executive meetings, the management carries out operational assessment, and communicates its results on a monthly basis to the departments (ZMK-NMD, 2006). The departments also receive the monthly controlling statements:

"In the beginning of the year, a plan is drawn up on the basis of the department-specific plans, reconciled with the latter, and then the departments are provided fast information every month on the development of their outcomes and they receive a detailed quarterly analysis as well. In case of major gaps between the plan and the fact data, we sit down to discuss that …" (Csidei, 2009/b, p.1.)

To sum up the above: ZMK evidently has long-term objectives and it systematically makes strategic plans. These focus on the patient as customer, but the hospital management pays attention to having good and effective relationships also with the other stakeholders. The objectives include efficient and economical operation. The hospital management controls target realisation by setting and systematically evaluating various target values, and through statistics made by controlling. The departments receive regular feedback on their performance.

In regard of the above, the case of ZMK differs from the previous 20 where the strategic approach played but a marginal role, but it conforms to the image suggested by

the basic literature items, namely that Lean will be really successful if it is combined with a strategic approach. That is, ZMK has a good chance to realise its process development efforts triggered by the strategic objectives. I shall present through the evaluation of the remaining factors to what extent the hospital has succeeded in that respect.

6.3.3. Evaluation of information concerning the internal processes of ZMK

This section takes a look at the internal processes of ZMK as reflected by the collected pieces of information.

The hospital started to develop its processes in 1991, first with the quality development methodology recommended by the WHO, then according to the ISO 9000 standards and, finally, by applying the TQM approach.

By 1995, the date of the ISO certification, however the specifications of the patient care processes had been ready (Rubecz, 2009). *"These are efficient and economical procedures, defined by the professional panels and demonstrated on the basis of international standards. In the diagnostics and in-patient care areas of the hospital, in line with the international classification of diseases, 70-80% of diseases is covered by established professional protocols, nursing protocols. The result is a standardised and documented approach in the most important diagnostic categories.*" (ZMK-NMD, 2006, p.31.).

The work continued also after obtaining the ISO 9000 certification and by 2006 resulted that: *"… every hospital activity is subject to process regulation, which provides the possibility of tracking along the entire care provision process, and the co-ordination of the individual specialist activities."* (*ibidem*, p.31.). To date, *"… operation is governed by the Rules of Organisation and Operation, the Data Protection Regulation and the regulations in the Quality Management Manual."* (*ibidem*, p.5.). The regulated processes are accompanied by regulated information flow: *"The MEDWORKS integrated health-care IT system accompanies the patient journeys and the process of patient care provision. The system provides on-line access to the procedure and operation descriptions, professional protocols and the Professional*

Recommendations of the Ministry of Health Care. The system provides for on-line data traffic and communication to the users of the entire institution system (care provision, appointments, laboratory and other diagnostics, medication and other information." (ZMK-NMD, 2006, p.28.). In connection with the processes, the activities of the involved individuals are regulated as well: "*The job descriptions specify the position, jurisdiction, responsibility, competence area, scope and manner of contact-keeping, replacements, specific tasks and competencies. The competencies are reviewed annually.*" (ZMK-NMD, 2006, p.18.).

Of course, the above makes sense only if it exists outside the books as well. This is what the Chief Managing Director says about the life-likeness of the regulation: "*We can carry through the processes in a regulated way, so that we do not regulate by the book, but the regulations are there in the heads.*" (Csidei, 2009/a, p.1.)

As of 2005, indicators have also been assigned to the processes. The processes are under continuous supervision; the process owners may alter the standards, if that is necessary. The processes are evaluated by the department heads at least once annually, and they are also assessed by the annual audits and by an independent organisation on the occasion of the renewal of the ISO certificate (ZMK-NMD, 2006)

Under the effect of the above, the operation of the hospital has become more stable and transparent respect of that before: "*It has become obvious soon that the processes are good: they regulate what had been unregulated before. For example, whether the head physician will do the rounds or not, what the responsibilities, rights and duties, respectively, of each person are. ... There will be development: the patient will be more satisfied and I as professional will understand the processes more thoroughly ..."* (Rubecz, 2009, p.1.). The existing system also provides for further development: *"… I felt that the orderliness and transparency which the standards provide for us will, may, improve our daily activities, this is where our chance lies. This is how we can produce such results in our professional activity as will let us excel from among the other hospitals."* (Kránitz, 2008, p.1.)

That is, process deficiencies and development options are highlighted by the audits, the patient satisfaction surveys, the nonconformity reports, the committee reports, the labour inspections, and the accidents, which thus represent the basis of

process development (ZMK-NMD, 2006). In addition, controlling feedback also specifies some areas worthy of development: *"The [departments] also receive proposals on a regular basis in the form of this quarterly settlement. It contains a narrative analysis of the assets of the department, and a proposal is made as to what controlling sees and how that could be improved.*" (Csidei, 2009/b, p.1.)

The specific defect mentioned most frequently in connection with the current processes is the burden implied by the documentation obligation: "*As practicing physician for 30 years, I must say that when I started to work, I spent around one hour writing and seven treating the patients ... now, however, I spend three hours with the patients and another seven hours documenting, documenting, documenting my activity*." (Kránitz, 2008, p.3.) Therefore, the current Quality Manager is of the opinion that the decrease of the administrative burdens is an important line of development: "*To reduce the workload of the staff, we shall try to simplify the documentation. However, care must be taken to put down in writing whatever has to be recorded. In addition, if possible, we would like to relieve the staff from the burden of duplicate documentation*" (Kárnitz, 2008, p.3.)

What may give some cause for concern in ZMK's case – from the point of view of Lean – is that process audits do not monitor the processes themselves: "*As for the processes, what we can check is how they were documented.*" (Kránitz, 2008, p.3.). The documentation can cover up the deficiencies that lead to the problems mentioned on several occasions in the 20 cases analysed previously. This is a real threat, as indicated by what Kránitz writes about the experiences of capacity optimisation in the central operating block (2005, p.17): "*The quality assurance system at ZMK requires the precise definition of the horizontal and vertical communication paths. This has actually taken place, their operation is controlled, Nevertheless, we still experience that the deficiencies of the system often result in communication asymmetry."*

As shown by the above, the hospital has been making efforts for decades to make its processes more transparent, standardised and regulated. Nevertheless, errors and open development options exist also at ZMK. As for the outcome, it is promising that the system can call the attention of the hospital management and the department heads to the deficiencies in several ways, and to provoke change that way.

Thus ZMK differs from the previously described cases, where the process-related comments often referred to lack of transparency, also in terms of process transparency. A further, but probably related difference relative to the other cases is that in the case of ZMK, the interviewees did not mention process complexity as a special characteristic of health care.[20] In order to evaluate the actual reliability of the processes of ZMK, however, further and more detailed research would be needed.

6.3.4. Changes

As indicated by the general presentation of the hospital, not one, but several processes of change took place at ZMK. It is useful to distinguish these in the further part of the analysis to obtain a clearer picture. I chose two distinction criteria: the date of the change and the relationship of the development to the bases. Accordingly, one may speak of past and present (recent past and present) changes and distinguish deep-ranging (radical) and routine developments. Let us first take a look at the past changes.

Past changes

The past changes, which are relevant here started in the early 1990s. The motive behind them was the interest and enthusiasm of the young management concerning the novel management/organisational principles, and the change of the environment: "*At that time, one could see already that, sooner or later, some quality management processes, too, would also start in health care."* (Rubecz, 2009, p.1.). The first steps of the change consisted in the implementation of what was heard at the quality development training of WHO, in the framework of committee work. The initial steps, however, brought little result (Rubecz, 2009) The next step of the process of change was the implementation of the principles of the ISO 9000 quality assurance standard series, with the help of external consultants. This activity was a radical development which took place in the past.

[20] They probably had little experience regarding the industrial production processes; hence they had no basis to compare.

The application of the adapted version of the standard in the following years can already be regarded as routine development, the tools as well as established practice of which were available: "*Under their [the consultants'] management, we have reached the phase where the patient provision processes – out-patient care, in-patient care and the related nursing and diagnostics -- had been worked out at every department.*" (Rubecz, 2009, p.1.) The ISO 9000 certificate acquired by the hospital in 1995 had already been an integral part of the process, that is, it was routine development. Indeed, from this perspective, I also regard preparation for the audits based on the standards, the introduction of the TQM approach and the launch of the self-evaluation project according to the EFQM excellence model as routine development, while acknowledging that they all demanded intense work. The changes obviously enjoyed the support of the senior management (e.g. the Chief Managing Director), that is, this was obviously a process of change initiated from above.

Present changes

Part of the changes taking place in the present occur under the effect of past developments. Thus, for instance, the further development of the processes is made possible by the existence of processes descriptions, a metric system, the audits and other tools of problem identification (e.g. work in committees) which can explore the areas in need of development:

"[The managers] compare their index values to the corresponding ones of other, foreign, university clinics or similar institutions, and they initiate projects themselves if their indices start to deteriorate." (Csidei, 2009/a, p.1.)

That is, it follows from the nature of the present developments that they can be considered routine ones. Part of the changes is directed, aiming at the realisation of the strategic objectives:

"*The hospital management evaluates the results achieved by the institution regularly, on a monthly basis, at the meeting of the executive body and the matrons, thinking together with the medium-level managers; they call make the difficulties explicit and listen to problems*." (ZMK-NMD, 2006, p.42.)

Another level is represented by development projects triggered by topical problems or the propositions of employees. Here the main goal is not so much the realisation of direct strategic objectives, but rather that of such general targets as the enhancement of patient satisfaction or the improvement of operational efficiency. However, as can be seen, the management supports through the institutionalised system also the initiatives of the rank-and-file, so to say, and so the workers increasingly feel that they are the owners of the system:

"Initially, [quality development] was about the implementation of the ideas of our former managers. Now, ...[the staff] feel a need for it." (Csidei, 2009/a, p.2.).

During the development projects, ZMK had to face the problem of limited access to resources, and the recent transformation of health care financing reduced the financial resources of the hospital even further. Therefore, ZMK feels this constraint and, consequently, the need to exploit the available resources as efficiently as possible, more than ever:

"At the moment the better exploitation of the existing capacities seems to define the direction of progress ... we shall not have more resources" (Kránitz, 2008, p.3.)

The hospital has already gone through a financial crisis in the mid-1990s, and it has managed to overcome it thanks to the tools provided by process development and controlling (Kránitz, 2008; Rubecz, 2009). The previously applied tools, however, can no longer ensure the necessary efficiency enhancement: new solutions are needed:

"I feel, personally, too, that we are in trouble. Not only in regard of health care, but also quality development in health care. We should move on somehow. We all feel that, but with our daily workload, it is difficult to define in which direction we could proceed and ... whom we should proceed with. ...One possible option is lean management, but that is rather alien to health care practice." (Kránitz, 2008, p.1.)

The hospital will only be able to overcome its current situation by new, probably radical, developments. Whether Lean will chosen, or it will be possible to find less "alien" alternatives to health care is currently impossible to say. Anyway, many hospital professionals have already experienced radical changes when they began to apply the ISO system, the philosophy of which was also alien to health care. This past experience could help to overcome the actual difficult situation as well.

The strategic role of the changes, the management commitment and the employee involvement

ZMK's quality and process development efforts look back on a history of more than a decade. As we have seen, the developments are an integral part of hospital operation. Let us examine, however, to what extent the hospital management has managed to extend the system to the entire organisation.

As indicated above, the management called on every department to take part in process mapping and standardisation:

"The departments made this themselves, without guidance from above. Then, of course, there was a group which decided whether the process would be appropriate or not." (Rubecz, 2009, p.1.)

Since quality and process development is part of the strategy, every department must take part in it. The performance of the departments is regularly monitored through the fora presented above. Every employee is informed of the objectives of the hospital:

"We go to the department meetings, with head physicians and matrons, where everyone is present, and we tell it there, and also at other meetings where everyone is present. ... We tell it a thousand times." (Csidei, 2009/a, p.1.)

As shown in the section on the analysis of the basic literature items, the model example of the managers and the attitude of the employees are decisive for the success of the developments. In ZMK, the upper management supports the developments and they participate in the work with full conviction:

- "*I am convinced that the entire system must not and cannot be operated well without the participation of the manager."* (Csidei, 2009/a, p.2)
- *"The managers personally take an active part in the activity of the development teams."* (ZMK-NMD, 2006, p. 4.)
- *"In relation to problem solving, ... I do my best to take part and tell my opinion on every project of relevance for the institution or its work, as initiator or as participant."* (Csidei 2009/a, p.3.)
- *"The department heads launch project themselves. They identify the causes of divergence and take measures."* (Csidei 2009/a. p.1.)

In addition to setting a model example, the management also motivates the workers to participate in the development activities:

"…there is a problem, a task to be solved, let's find the people … who are really concerned about it. ...let's involve them, ask them, let's try to solve the issue together." (Tihanyi, 2008, p.1.). The *Quality Manager has a monthly budget to remunerate the activity of those workers who did much for the quality issue in the given month. Moreover, the workers can present the achievements concerned at professional conferences."* (Csidei, 2009/a, p.1.)

Motivation is complemented by coercion: the Quality Management Manual (MIKK) declares that *"the continuous improvement of service quality is the task of every staff member of the hospital*." (ZMK, 2008, p.10.) The management actually communicates this obligation consistently to the workers:

"They must realise that this is not an issue of relevance for a few persons, the manager only, but it is also their task …" (Csidei, 2009/a, p.2.)

Apparently, the development strivings are present in the everyday life of the hospital. In the absence of precise data, we do not know to what extent this is so. There is only an estimate available to us on the level of the workers' awareness of the quality and process development efforts:

"They know about the existence of such an approach in the sense of being aware of its components present at the department,… I think, everybody knows that. As for the level of mastering the relevant way of thinking, to the extent of being able to take the initiative … by the bedside [at that level] … half would be most optimistic estimate …" (Tihanyi, 2008, p.2.)

Summary

Thus, in ZMK's case, the nature of the changes differs from that in the previously analysed cases. Here we can track a programme-like change, as is discussed in the four articles declared our basic literature items: it consists of a strategy-level, long-term series of hierarchically structured events (even if the strategic domain had not been present as a motivating force initially). As we have seen, ZMK has managed to establish a system of process and quality development institutions, and have that accepted by the workers. The system is therefore capable of producing results, as is

witnessed by the decrease of debts accumulated in the beginning and the acquisition of various certificates and quality awards. ZMK thus demonstrates that it is possible to adapt methodologies which come from the industry and to apply them with success in health care. Therefore, although this case differs from the previous ones, it does not contradict those; it only contains experiences in excess of them. The presentation of further details will show significant similarity with the difficulties and problems encountered during development in the previous cases.

6.3.5. Objectives and scope of the development projects

The previous section showed what triggered the quality and process development programme in Zala County Hospital. This section gives a brief description of the relationship of the objectives of the development projects to the strategy, and the objectives and scope of the projects.

As indicated in the previous section, the developments were of the top-down type, but the institutionalised systems make it possible to implement bottom-up initiatives as well. Part of the projects is, accordingly, directly related to the implementation of the strategy, it is directed top-down, and typically brings about changes of major relevance (as the relocation of the psychiatric department in 2008), whereas others solve local-level problems or implement local developments by using local resources (and the support of central institutions). By way of example, let me give a brief description of the projects mentioned in my discussions with the hospital managers. This presentation is not a comprehensive review, but only an illustrative one. My objective is to let the reader see the similarity between the approach adopted in the developments of this hospital and that in the previously described projects. The short summary of the exemplary projects is shown in Table 10.

The ZMK projects are similar to those presented in connection with Royal Bolton Hospital in regard of their two-fold nature.

Table 10: some examples of projects conforming to the lean approach in ZMK

1. Optimised capacity utilisation in the central operating block (Source: Kránitz, 2005)	
Initial state:	The central operating block functions as an independent, autonomous unit. The operating wards which use the services of the operating block could not fulfil the envisaged elective operating schedule, which has led to delays and cancellations of operations and, in connection with that, the deterioration of the patient satisfaction indices. All previous attempts to solve the problem failed.
Action:	Appointment of authorised project leader exploration of the underlying causes; analyses of related interests; specification of solution proposals. Precisely defined planning process to design the operating programmes; to improve the flow of information; development of asset supply and maintenance.
Outcomes:	Decrease of the number of cancelled operations (by 32 % from 1st half 2004 to 1st half 2005); increased anaesthesiology efficiency (27 % less staff provided 92 % performance).
2. Relocation of the neurology department to the internal site of ZMK (Source: Rubecz, 2009)	
Initial state:	The neurology department, responsible also for stroke cases, used to be at an external site, whereas cardiology was on the internal premises. To make the examinations and tests, the patients had to be transported from one site to the other, and this implied additional stress for the patients.
Action:	Based on funds granted by application, new premises could be created for the neurology department in a new building on the internal site.
Outcomes:	Care of higher quality; elimination of the transportation tasks and related costs.
3. Use of new-type infant trolleys (Source: Rubecz, 2009)	
Initial state:	In the openings of the old rack-type trolleys, the infant's foot could slip out or get squeezed or, in worse cases, (on the basis of the experiences) it could even brake. This has led to pain, treatment expenditures and occasional litigations.
Action:	Search for new solutions – procurement of trolleys with transparent plastic walls.
Outcomes:	Termination of injuries due to squeezing.
4. Process reorganisation in the genetic laboratory (Source: Tihanyi, 2009)	
Initial state:	One person – one method work, 9 persons
Action:	Merger of the common "kitchen work"
Outcomes:	Process-approach based work, 6 persons

5. Reorganisation in the paediatric department (Source: Tihanyi, 2009)	
Initial state:	Separate nursing staff at the department and the specialised consultation. The nurses working in the department were over-burdened; at the specialised consultation the nurses sometimes waited for the doctors.
Action:	The matron in charge of the ward treated the tasks presenting themselves in the department and at the specialised consultation one-by-one, and allocated the staff accordingly.
Outcomes:	The work load of the department nurses decreased.
6. Reorganisation of the work processes of specialised consultation on internal medicine (Source: Tihanyi, 2009)	
Initial state:	Three specialised consultations simultaneously; small waiting area; the physicians work also in the department. Consequently extreme crowdedness, dissatisfied patients, frustrated workers.
Action	Process optimisation carried out in group
Outcomes:	In progress
7. Optimisation of the work processes of the central laboratory (Source: Tihanyi, 2009)	
Initial state:	Administration done by the assistants; crowdedness in the morning hours; delays in blood sample taking.
Action:	Process optimisation carried out in group
Outcomes:	In progress
8. Development of the flow of information concerning blood ordering (source: Tihanyi, 2009)	
Initial state:	The blood supplier learns of the demands of the departments belatedly, and thus it cannot always satisfy them. This results in the postponement of the interventions.
Action:	Development of the flow of information as part of the activity of the transfusion committee: The departments inform the blood supplier of their expected needs one week earlier. On that basis the blood supplier takes measure to procure the blood or discusses a change in the schedules of the demands.
Outcomes:	In progress

Source: Compiled by the Author.

As illustrated also in Table 10, many of the projects implemented by the hospital focus on patient satisfaction enhancement, higher-quality professional care, and the enhanced efficiency of the care-provision processes. As for their complexity, some are simple projects implemented within the limits of the wards (such as the procurement of

the novel-type infant trolley to prevent injuries), others are more complex (such as the reorganisation of the processes of the genetic laboratory) and some are highly complex projects of relevance also for inter-departmental patient flow, which require significant material sacrifices and time (such as the relocation of the neurology unit).

Bottom-up initiatives typically aim at quality development which, according to the generally accepted health care interpretation, includes efficiency enhancement as well. Tihanyi (2008), Kránitz (2008) and Csidei (2009) mention the following project objectives by way of example:

- Patient satisfaction enhancement (information supply, waiting times, physical environment, pain, privacy, etc.)
- Patient security enhancement
- Decrease of the level of frustration of staff members,
- Reduction of the administrative burdens
- Enhanced operational efficiency,
- More economical operation,
- More precise administration.

In summary, with its programme-type treatment of developments linked to the strategy, and its institutionalised system for the realisation of top-down and bottom-up initiatives, ZMK applies the solution implemented at Royal Bolton Hospital, declared to be the only feasible arrangement according to the basic literature items.

6.3.6. Project management (participants, form, motivation)

As mentioned already, in connection with quality and process development, a distinction must be made in ZMK's case between the initial steps, which aim at the deployment of the system, and projects implemented in the established system.

Initial developments took place with the assistance of consultants. Actual change is preceded by training, which starts from the upper management and rolls on, snowball-like, through the entire organisation. The entire training process took around

18 months. (Rubecz, 2009). As for the complete process of the deployment of the system, no detailed data are available on that, except for few pieces of information:

- The deployment of the basis of the current system started in 1991 and took around 7 years. (Rubecz, 2009)
- Every department had to make its own process description which was then controlled centrally (Rubecz, 2009).
- In the beginning the managers tried to rely on the potential advocates and to get the major opponents on their side:
    - *"I would not say that everyone was most enthusiastic to take part in the work. Obviously, in the beginning we started with the staff members, with whom we had friendly contacts, whom we knew as good professionals...Who could obviously offer more than average, and then the whole thing [has kept] rolling on."* (Csidei, 2009/a, p.2.).
    - *"Then we assigned tasks to many among those who showed the strongest resistance, who actually accomplished those tasks quite well. At the end, as a matter of fact...., their strong resistance disappeared."* (Rubecz, 2009, p.1.)

The course of projects (mainly of strategic significance) started in a formalised way within the already established system as regulated by the provisions of the Project Management Manual. The objectives, circle of participants, tasks and deadlines of the projects subject to regulation are defined and documented precisely. (ZMK-PKK, 2009).

As for the circle of the project participants, typically, the management also takes part in the projects (ZMK-NMD, 2006), and they invite people who are interested in the given issue (Tihanyi, 2008). The everyday experience, however, is that not every staff member is willing to join the projects: *"Even after 13 years, there are still staff members in the hospital, who say 'OK, I am willing to do extra professional task, but if it is about quality, please leave me alone'."* (Kránitz, 2008, p.1.)

In the project, the commonly accepted form of work is obviously collective problem/task solution, but in contrast with the previously discussed cases, here the

project team meets for 1-2 hours every day or week. They use that time to discuss the tasks ahead, and appoint responsible persons and deadlines to them. (ZMK-PMKK, 2009) It is not typical for these teams to act collectively for several days.

The hospital management encourages the participation of the workers in the projects and in the development activity by their personal example/participation, through intensive communication, creative methods of work and by inviting the initiators into the project teams. It is typical of the attitude of the workers that *"The nursing staff spend more time with the patients.. they receive much more direct feedback. We have involved them in training from the start... the nurses have been responsive from the start.*" (Kránitz, 2008, p.1.)

The projects are supported by the institutionalised tools (committees, quality management offices) and personally by the managers: *"It is typical of all of our managers that we support every idea until it is demonstrated that it is not good, or that we cannot implement it for lack of resources or other assets."* (Csidei, 2009/a, p.2.)

Formal projects, the project course (steps) are precisely defined by the Project Management Manual (ZMK-PMKK, 2009):

- Project task identification
- Creation of the project organisation
- Creation of the project plan
- Project approval
- Project implementation
- Project monitoring
- Project hand-over /take-over
- Project closing
- Project evaluation
- Evaluation of introduction and efficiency at a pre-defined date.

The list shows that the Manual prescribes neither the exact project implementation process, nor the tools to be applied. Training is not part of the formal project. Nevertheless, there are quality management training programmes: *"200 of our workers have already participated in quality-management-related training and conferences"* (Csidei, 2009/a, p.2.)

In terms of project management, we can declare that ZMK established a regulated system of process and quality development, absent – with only a few exceptions – in the international cases. On the other hand, the established formalised system does not regulate the exact implementation of the projects and, moreover, apparently, the intensity of ZMK's projects lags far behind that of the "rapid improvement events" applied in the previous cases.

6.3.7. Principles and tools applied during the projects

This section briefly describes the principles and tools applied during the projects. However, in ZMK's case there is much less information on this topic than in the international cases.

Before a description of the specific tools, let's emphasise that ZMK's history contains a whole arsenal of principles, through which we can track a development in time. This is what Rubecz (2009) says about it: *"… [based on the ISO system] every department worked out its patient care processes ..... [then] ... we started to integrate into this system the professional parts. ...From that time on we have regulated not only the patient care process itself, but professional patient care as well within the whole… Then came the release of ISO [9000]2000 which already concentrates mainly on the processes. And, what is more, then comes a further transformation which merges various process parts and treats also the hierarchically structured processes of the various departments...No doubt, this has not been deployed on the basis of the TQM approach, but the TQM approach is subsequently integrated into the whole system... ...Later on we have had ourselves accredited also in the Hungarian system.*[21]*."* (p.1.) In what follows we shall see some comments concerning these systems.

The tool applied to deploy the system was – due to its nature – the process survey and description. (Rubecz, 2009). This obviously had to be connected with some degree of process optimisation for, presumably, the evident deficiencies and irrationalities identified in the real processes have not been taken over to the new process descriptions. However, no further information is available on this point.

[21] The Hungarian system is MEES, the Hungarian Health Care Standards.

As we have seen, the established system provides no specific implementation scenario for the formalised projects either; presumably the formalised and the informal projects apply similar tools. In the interviews mention has been made of the use of one of the basic quality development models, the PDCA[22] cycle. There are some examples (Laposa, 2009), but the system is not necessarily used consistently in every case: *"In health care and at our place too, one of the biggest errors or rather problems is that we detect the problem, we even get to the point of trying to find a solution..., and something may even happen but no back-testing: Was that good? Or why wasn't it good?...There are a few examples in the hospital, but it is not present in every project in a systematic way."* (Tihanyi, 2008, p.1.)

The principles and tools identified during the interviews can be assigned to the following groups::

- Transformation of the site layout. We have come across two cases in which departments were relocated from an external site to an internal one to simplify the treatment process (neurology; Internal Medicine I.) (Rubecz, 2009).
- Process analysis – operating theatre project (Tihanyi, 2008)
- Process re-design – Genetic laboratory (Tihanyi, 2008)
- Inventory stock regulation – minimum/maximum levels defined (ZMK-NMD, 2006)
- Reorganisation of work – paediatrics, reorganisation of the tasks of the nursing staff (Tihanyi, 2008)
- Causal analysis, error proofing (poka-yoke) – infant department (Rubecz, 2009); genetic laboratory (Tihanyi, 2008), central laboratory (Laposa, 2009)
- Regulated information flow – internal information system (ZMK-NMD, 2006); patient identification (Laposa, 2009)
- Standardisation, standard processes, standard operations – this is the central element of the application of the ISO standard

[22] PDCA, also called Deming cycle from the name of the statistician who disseminated the approach, is the acronym of Plan, Do, Check and Act.

> *"The preparation of the medical/professional algorithms and the nursing protocols represented the upgrading process regulation. These are efficient and economical procedures defined by professional panels or demonstrated on the basis of international standards. In the diagnostic and in-patient care areas of the hospital, these professional algorithms and nursing protocols cover 70-80% of diseases treated according to the international classification of diseases. The result is a standardised and documented approach in the most important diagnosis categories.*" (ZMK-NMD, 2006, p.31.). „… *each movement of our basic activities is regulated, and it is regulated by ourselves.*" (Csidei, 2009/a, p.2.)
>
> The practice of the genetic laboratory is a good example of standardisation: "*...to inform young mothers of identical problems, we always say exactly the same thing – it is typed in the computer...* (Tihanyi, 2008, p.2.)

I have only come across a few comments concerning the characteristics, advantages and drawbacks of the applied tools. These did not refer to specific tools, but described or compared systems or approaches:

- The terms which come form the industry are unusual (e.g. in the case of ISO standards) (Kránitz, 2008),
- Many are of the opinion that ISO standards cannot be interpreted in health care (Rubecz, 2009),
- The ISO system supports continuous development (Rubecz, 2009)
- The ISO system is a basis, quite suitable for the integration of other systems (Rubecz, 2009),
- EFQM[23] can be linked to the health care/professional issues and, therefore, the employees think that it makes more sense (Kránitz, 2008)
- New-type systems (such as the ISO system) initially imply more burdens for the workers (Rubecz, 2009).

These comments are worthy of consideration from the point of view of generalisation: Do they reflect the experiences of a single institution, or do they

[23] European Foundation for Quality Management – the aim of the organisation if to disseminate the TQM philosophy; it annually awards the prominent prize under the same name for the practical application of TQM.

describe a way of a thinking, obstacles, typical of health care as such? The underlying questions (industrial solutions vs. health care; standardization vs. autonomy of the medical staff; attitude to change, etc.) are highly similar to the problems encountered in the previous cases, so, probably, these are not unique phenomena. In conclusion, we can state in connection with the applied principles and tools that the interviewees and documents describe the various systems, but little is said about the specific tools applied during the projects. The most frequently applied tools are process description, standardization, and re-design. Apparently, there is no difference between ZMK and its foreign peers in this respect. Since little information is available on the actual manifestations of the tools, it is impossible to confirm this coincidence beyond every doubt.

6.3.8. Outcomes

This section describes the outcomes of the development efforts of the hospital.

Theoretically, the application folder prepared for the National Quality Award provides sufficient data to analyse the key indicators of hospital operation, but the figures there typically refer to the period from 2000 to 2005 and, moreover, there is no explanation attached to them. Thus, on the one hand, they are not suitable for the assessment of the effects of changes implemented in the initial period (1990s), on the other hand, figures for this period might be misleading anyway due to their coincidence with effects of the Hungarian health care reforms (which probably make the hospital results appear worse than they actually are), especially without supplementary explanation to the data. Therefore, the present analysis will not rely on the NQA application data. What is presented below is based on what was said by the interviewees.

One tangible outcome of the programme of process and quality development was the elimination of the heavy debt burden of the hospital at the time of its introduction, and the restoration of financial balance (Csidei, 2009/a). *"When I became medical director, we took over the hospital with a debt of HUF900 million. We cleared this HUF900 million debt by working over three years and, from that time on, the hospital has been making profit."* (Rubecz, 2009, p.1.) This positive turn was, of course, due

also to the deployment of a controlling system and further measures to tighten business management.

The direct effect of the introduction of process development according to the ISO system was that the processes became regulated and consequently transparent:

"It has soon become clear that the processes are good: they regulate what used to be unregulated. For example, whether the head physician will make the rounds or not; who has what obligation, right, who has to do what." (Rubecz, 2009, p.1.) *"…regulation makes things easier for the management, and easier also for the employees.*" (Csidei, 2009/a, p.2.).

Process regulation and transparency has led to efficiency improvement and, indeed, the former opponents of the system have also found it easier to it in view of the outcomes:

"...when the system was established, they [the former opponents] realised that they can accomplish the same with less work and less mistake" (Rubecz, 2009, p.1.). Kránitz (2008) speaks of acceptance on the professional side: *"...the staff members increasingly accepted that this [quality management] was not something apart from the therapeutic activity, but some kind of a complement to it... and that it promotes therapeutic activity"* (p.1.).

In addition to the general outcomes, one of the typical results of the specific projects mentioned by way of example was efficiency enhancement (e.g. the same work being done by 6 instead of 9 workers (Tihanyi, 2008)).

In summary of the outcomes, the process and quality development programmes have managed to establish process regulation and transparency. This is an outstanding result, especially in the light of the international cases, in which most treatment errors were the result of lack of process transparency and of a clear allocation of the tasks.

6.3.9. Resources

According to the basic literature, one of the success factors of Lean is the availability of the resources needed to execute the changes (Radnor et al., 2006). This section will show how this applies to the case of Zala County Hospital.

The most prominent message of the interviewees concerning the material resources was their shortage:

"We have no financial sources; it is therefore worthy of praise that an institution can go on doing this ..." (Csidei, 2009/a, p.2.)

Kránitz (2008) counts on the development to offset the shortage of material resources: *"...we try to organise our processes so as to have no redundant overlaps, because we have no capacity for that and we shall have less and less such capacities*" (p.3.).

The hospital employees do the work associated with the implementation of programmes and projects in addition to their routine daily activities; the quality management department employs only one qualified expert and one administrator on a full-time basis. Consequently, the developments imply significant extra burden for the workers who take an active part in the programme.

The hospital improves the competencies of the workers at internal and external sites, sometimes by training provided by professional trainers.

In connection with the management of the changes and the management of the hospital in general, the Chief Managing Director calls the attention to the importance of the special competencies of the managers:

"To manage an organisation like that at such level, you must have an adequate manager stratum. You need people who are at such level, who ... are really familiar with ... certain topics." (Csidei 2009/b, p.2.)

That is, as far as the resources are concerned, the Hungarian hospital seems to be worse off than of its foreign peers in terms of financial resources, but it does not differ from them as far as the human resources are concerned. In ZMK as elsewhere the workers take part in the developments in their leisure time. As for the competencies of the upper management, the leadership of ZMK sees clearly: they feel the importance of

special managerial/leadership skills. They approximate in this respect the vanguard of the foreign hospitals.

6.3.10. Organisational structure

Similarly to the previous cases, organisational structure issue is not a prominent issue in ZMK either.

The NQA application document says promising things about the interrelationships of the organisational units: *"the professionally tightly connected departments such as cardiology – internal medicine, radiology – surgery, regularly agree on what they need from one another*" (ZMK-NMD, 2006, p.27.)

The comments on the formal management structure suggest that there are more features for the changes:

- The management looks of opportunities for direct communication:

  "It is the objective of the management to make the executive decisions and their causes known at every level of the organisation" (ZMK-NMD, 2006, p.5.).
- Another positive sign is the fact that there is a separate organisational unit dedicated exclusively to quality and process development, even if the unit consists of only two main-job-holder employees (the quality manager and his deputy do their tasks outside their working hours).
- Yet another positive sign is that quality management is a special agenda item on the institutionalised executive fora. (Csidei, 2009/a).

All in all, the organisational structure leaves sufficient ground for developments. This again suggest that ZMK's efforts have not been in vain; the hospital is ahead of many of its foreign peers also in this area.

6.3.11. Organisational culture

Patient satisfaction is the trivial **common value** of the hospital organisations. *"Here, at our hospital, we have measured patient satisfaction for quite a long time... there are some expectation concerning the service... the same as in any other service provider company. How that [the fulfilment of that expectations] is measured? It is said that the measurement of patient satisfaction is the most suitable for that*" (Laposa, 2009, p.3.) In ZMK, the management tries to make the workers aware of the importance of patient satisfaction (ZMK-NMD, 2006). The measures taken in practice in the interest of patients have already been reviewed in the section on the objectives of the organisation.

In addition, hospital workers speak frequently of the "vocation" as the target of their work. Many remarks indicate that their initial rejection of the standardization efforts was due to the fact that they did not see how those were related to their "vocation", that is to patient care and medical treatment (Kránitz, 2008; Rubecz, 2009). As a matter of fact, the developments introduced later on could be successful because they managed to establish the link between standardization and the quality of medical treatment: *„…the staff members have also increasingly accepted that this [quality management] is not something apart from the therapeutic activity, but a complement to it... and it promotes the therapeutic activity"* (Kránitz, 2008, p.1.). Consequently, the "vocation", that is, quality care to patients, obviously occupies an important position in the value system of ZMK. The same value was present in the foreign hospitals as well.

The interviews made at ZMK made no reference at all to conflicts between the various wards or specialisations. The thesis Kránitz (2005) on the development of the efficiency of the operating theatre, on the other hand, makes a reference to "*conflicts of interests between the departments*" (p.30.).

The informal power structure plays an important role in the organisational structure of Zala County Hospital. As elsewhere, there is an overlap between the formal and informal power structures; in practice, the consent of the upper management is most important for every decision.

At the same time, the coexistence of the traditional and the ISO/TQM approach can modify the weights of real vs. formalised power at several points: the upper management makes efforts to involve the lower levels in the solution of problems, to

enable workers, often on a routine basis (Tihanyi, 2008). However, this spirit often changes at the level of the department heads...*"The biggest problem ... is that head physicians acting as department heads are more difficult to involve than their deputies*.... (Tihanyi, 2008, p.2.). The power of the upper management, however, is typically not applied against the senior department heads, because *"There is nationally some kind of fear on the part of hospital managements that the [physician, head physician] will simply get up and go and they would be left without doctors.*" (Laposa, 2009, p.4.) On the other hand, senior department heads often consider their professional knowledge and achievements the pledge of autonomy, and they refuse to hear other points of view. (Tihanyi, 2008 3. old.) Since their professional knowledge is really a major asset, it is difficult change this approach:

"Department heads, who are also professional leaders, know much more about their area than the Chief Managing Director or the Medical Director. In addition, there is some mystification about the no doubt true statement that "human lives are at stake here", which is often used as a defence." (Tihanyi, 2008, p.1.)

The person of the senior department head is decisive for the quality development activity of the department: *"At departments where the managers are supportive, quality management is effective; where they are not, it is less effective.*" (Kránitz, 2008, p.1.)

There are few references to the presence of problem treatment in the organisational culture of the hospital. On the one hand, it seems that there are departments where the leaders are aware of the fact that errors may occur, and if they do, they try to explore and eliminate their causes: *"...we have built [into the process] previously non-existent security measures ...*" (Tihanyi, 2008, p.2.)

On the other hand, one comes across the problem indicated in the previously analysed cases, namely that in a "blaming culture" you will be stigmatised, if your name has occurred in connection with an error: "*I have already proposed not to use in our hospital the expression "nonconformity report", because people are somehow "averse" to that. ...If I issue a "nonconformity", that irritates people*". (Laposa, 2009, p.2.)

Since the ISO/TQM system itself requires regular process supervision and action and amendments in case of nonconformities, change has become an institutionalised

part of hospital operation. Nevertheless, organisational culture is far from uniform in this respect: no relevant "norm" exists:

"There are always some more open persons; there is always a medium range which can be influenced if you are agile enough, and there is a group that will resist and be in opposition whatever you do, and you will not be able to change that." (Tihanyi, 2008, p. 1.)

Of course, aversion to change may be due to deeper personality traits, but the comments suggest that it diminishes with the progress of time.

In the early 1990s, when the ISO system was first introduced to the hospital, only the Chief Managing Director and a few persons around him were receptive to it (Csidei, 2009/a). During the training events and the preparation of the first process descriptions, even managers who are really committed today felt some aversion, because they did not understand the way of thinking, the essence and the implications of the system. (Kránitz, 2008). Health care thinking is *"furiously opposed"* to standardisation (Kránitz, 2008, p.1.). The majority of workers was not enthusiastic about the changes (Csidei, 2009/a); on the contrary, they typically showed rather marked resistance (Rubecz, 2009). "*The simple fact that we called health care a service was very difficult to push through, it took years …*" (Laposa, 2009, p.3.) Initial resistance was eased by the involvement of advocates (Csidei, 2009/a), by assigning task parts to opponents (Rubecz, 2009) and by convincing all with arguments based on prospective individual benefits (Tihanyi, 2008). *"By 2002, we felt that resistance had weakened, and maybe everyone admitted that this work had its benefits, too – they no longer thought it was something bad that had to be done willy-nilly*." (Kránitz, 2008, p.1.). Nevertheless, there are still some persons who categorically refuse to take part in quality development under any form (Kránitz, 2008). Tihanyi (2008) may have had them in mind when he spoke of the "opposition".

The heterogeneity of organisational culture in regard of the attitude toward changes may be typical of a certain phase of development: the new way of thinking is already natural to some, but not to all.

One possible conclusion is that the "systems change" is far from being over at the hospital. If this is the case, it is important for the management to see clearly that, unless it can make the majority take its side, its current supporters may also become disappointed and a restoration process may start.

ZMK's experiences are of a novel type, anyway, both in relation to the basic literature items and to the international cases, and they are in a complementary relationship with what Radnor et al. (2006) wrote about organisational readiness.

In terms of the correlation between the professional area of the workers and their responsiveness to change, the experiences of ZMK partly coincide with and partly complement what we have seen in the other cases.

The rate of participation in the developments is higher among the members of the nursing staff and lower among physicians. This has been explained in several ways:

- *"The functions of the physicians are more divided among in-patient and out-patient care and ...care for private patients, and they are more difficult to involve in terms of time, due to the scarcity of their time ..."* (Kránitz, 2008, p.1. old.)
- *"The nursing staff spend more time with the patients... they receive much more direct feedback...*" (Kránitz, 2008, p.1.)
- "*The degree-holder nurses consider it a privilege ..."* (Kránitz, 2008, p.1.) They see it as a way to excel from among the vocationally qualified nurses, with whom they work together, in the same shift, due to the shortage of nurses.

There are noticeable differences in the fulfilment of quality management tasks not only between the physicians and the nurses, but also between the various departments. Kránitz (2008) attributes that first and foremost to the person of the senior department head.

Let us note in relation to the attitude to change that personal interests, which do not necessarily coincide with those of the hospital, may also influence the reactions to change. Thus, for example, in his thesis on the optimisation of OR capacity, Kránitz (2005) describes as a retraction force the system of parasolvency, which may generate adverse interest on the side of those concerned, and suggests that transparent operation itself may also violate personal interests (p.30.). **This component of the attitude to change has not been mentioned either in the basic literature or in the international cases.** This, of course, may be due to the fact that the parasolvency system is not typical

in other countries. However, the examination of the various individual interests may be important anyway.

In contrast with the basic literature items and the 20 foreign cases, the issues of developing "own experts" and of organisational learning, considered most important for the success of the carmaker by prominent researchers of the Toyota system (Liker, 2008; Fujimoto, 1999), have come up at ZMK. Laposa (2009) sees the training of employees who adopt the ISO/TQM approach as the pledge of efficiency and effectiveness:

"…if in the future … efficiency will be important, and effectiveness, … i.e. the quality you can produce from a given amount of money, [the hospital]… will have to raise and train its own workers to really understand and apply these things, to integrate the ISO standards into their profession instead of coming to hate them. At our place, they have already been integrated to around 30-40%." (p.3.)

As for continuous feedback and the opportunity of learning, this is what Laposa (2009) says: *"Health care has been accustomed to things going on on their own. They make the mandatory regulations, … and then no one checks whether things actually go that way. [It would be important] to teach the most important thing: they should consciously take improving, corrective measures, and have ideas … The learning spiral becomes shorter …"* (p.3.).

That is, the way of thinking which provided the long term success to Toyota, is present in ZMK – even if as a point only. The case of ZMK is especially interesting in this regard in the area of the lean transformation of hospital processes and, as such, it is absolutely worthy of further analysis.

To sum up: ZMK's case suggests that organisational culture is not a homogenous factor, a general characteristic of the organisation, as could be assumed on the basis of the basic literature items. Its "uniformity" seems to break against the demarcation lines of the jurisdictions (nursing staff vs. physicians) and the hierarchy levels (physicians, senior department heads, the directorate), and there may be significant differences even among workers in the same group, based on personal disposition and interests. In many respects, the case of ZMK provided

the same results as the previously analysed cases, but it has helped differentiate the picture at several points.

6.3.12. External support

In regard of external support, too, ZMK seems to know its limits and it wisely calls on professionals who are experts of this field for help. This idea has been expressed several times during the interviews. The hospital management has apparently been aware of the fact that an external perspective can provide it with essential pieces of information:

- *"Then Várszegi et al. agreed with [the consultant firm] ...they had a special quality group ... they concluded an agreement and ISO-based quality development and process specification started at us on that basis."* (Rubecz, 2009, p.1.)
- *"We commissioned an external consultant ..., because we felt that we cannot really reconcile the strategy and the objectives, and the implementation ...*" (Csidei, 2009/a, p.2.)
- *"It is highly important for a quality-driven hospital to be open to new things and, if possible, be the first to apply them.*" (Laposa, 2009, p.3.)

That is, Zala County Hospital consciously looks for ways and means to integrate novel-type knowledge and skills. Such conscious management is rarely encountered in the foreign cases, albeit its importance is highlighted also in the basic literature.

7. Synthesis of the research results

On the basis of the above, this chapter will outline the picture composed of pieces of information concerning the lean transformation of hospital processes available to me in the Hungarian and the international literature and in the researched case.

7.1. Objectives of the organisation, customer value, performance measurement

According to Womack – Jones (1996) and Liker (2008), the focus of lean management is the identification and satisfaction of customer needs. Lean management is not simply a tool, but an approach which defines the very basis of the objectives and operation of the companies (Liker, 2008). That is, Lean is more than the application of certain tools: it means the adoption of an approach, a new expression of the objectives. One of the tools for realising the objectives is strategy-making and execution. This is how one can deduce logically the statement expressed by Radnor et al. (2006) among others, namely that for Lean to be effective in the long term, the hospitals which apply it must do so at the level of the strategy.

The research results suggest that, to date, the majority of hospitals does not link Lean to the strategic objectives, but applies it only to eliminate the obvious deficiencies and anomalies. Apparently, among the few exceptions ZMK defines its operational objectives, relationship with stakeholders and strategy much more consciously than most of the actors in the other researched cases. This, however, is probably not the whole truth, since several institutions seem to lag behind ZMK in that respect, while representing the vanguard of Lean internationally (e.g. Virginia Mason Medical Center, Royal Bolton Hospital). This apparent contradiction may be due to the fact that I analysed the foreign cases on the basis of secondary information sources. But it probably does not alter the fact that only a minor group of hospitals applies Lean as a strategic approach, in line with the spirit represented by Womack – Jones (1996). The background of that is not clear. One possible explanation is that the hospitals have not

reached the stage where their well-organised processes might represent a strategic resource, a competitive edge; instead, they are used to eliminate the (strategic) backlog due to disorganised processes. The build-up of the strategic role of process development is also a process itself (Wheelwright – Hayes, 1985), and a time-intensive one at that.

Since the strategic approach to Lean, is typical of a few hospitals only, it is hardly surprising that the identification of customer needs is not a frequent topic either. Apart from ZMK's case, it is explicitly mentioned in a single foreign source (Fillingham, 2007). It is thought-provoking, on the other hand, that even the hospitals with relevant initiatives fail to go beyond the "patient = customer" approach. This is partly explained by the writing of Womack –Jones (1996) which regards the patient as the customer of the health care service. Other possible explanations are eg. that: the complex customer approach is too far from the traditional approach, or its definition would take up too much time and energy, or maybe the circumstances (e.g. regulations) change so fast that such a definition of customer value would have to be excessively sophisticated and expensive. On the other hand, however, given the well-known specifics of health care, it would seem logical to proceed to a more complex customer definition, as is proposed by several researchers (Young – McClean, 2008; Proudlove et al., 2008; Angelis et al., 2008).

The significance of performance evaluation systems for value creation, target setting and realisation is a commonly accepted fact in the area of business economics (Ghalayini et al., 1997; Wimmer, 2002). Although the research of Radnor et al. (2006) reveals the negative effects of inadequate performance measurement systems, the foreign cases suggest that the hospitals do not pay attention to that either. In these cases, index values are used exclusively in connection with the presentation of the problems or the outcomes. This seems to confirm my assumption concerning the absence of the link between objectives and strategy, but it does not allow to draw any further conclusions. ZMK excels in this regard as well: it operates systems of this type, but the examination of their real effects would require further research.

In summary, the cases seem to confirm the previous concerns raised in connection with the absence of the specification of customer value and also neglect of the link between Lean with the strategy. The apparent contradiction implied by the fact that the efforts concerned have nevertheless been successful can be solved by the realisation

that the initial developments are always trivial ones, and these success criteria are not really decisive in their case.

7.2. External stakeholders of hospitals

In the context of hospital operation, external stakeholders may include several groups in addition to the obvious group of patients. ZMK makes conscious efforts to manage these groups In the basic literature, Radnor et al. (2006) identify external stakeholders first and foremost as actors compelling change, whereas in the foreign cases, this issue is treated exclusively by Laursen et al. (2003), who emphasise the potential (negative) impact on effective operation of the regulatory authorities in connection with quota-based financing which may actually impose a penalty on Lean.

As in the case of customer value described in the previous section, external stakeholders, too, may exert a significant impact on operation, and hence the conscious management of the relationships established with them warrants more intensive attention. This observation is in agreement with the extended interpretation of Lean, in which the company (hospital in the given case) is not conceived of as a dissociated unit which operates independently of others, but rather as part of a system, in which the interrelated components will only be successful if they can assess the interests of the "whole" and adjust to them (Womack – Jones, 2005). Given the interdependence of the components of the health care system, this system-centred approach ought to receive special attention there (Brandao de Souza, 2009, Várszegi, 2009).

7.3. The hospital processes and their errors

The results of the survey covering the hospitals of the US called the attention of the world to the fact that the rates of errors and undesirable events in health care exceed several times the corresponding typical rates in industry (IOM, 2000). Despite the national differences in the operation of the care provision systems, it is typical of

hospital care in general that there are many events which exert a negative influence on the state of health of the patient and are independent of the disease/injury and could be avoided (Leape, 1994; IOM, 2000; Tucker and Edmondson, 2003; National Audit Office, 2005; Brodt, 2006; Schenk, 2006; Kollberg et al, 2007, Williams et al., 2009). Human negligence is frequently encountered in the researched cases, so much so that one of the main targets of the development processes is actually to eliminate that (Spear, 2005). In addition, there are many problems which relate to the quality and efficiency of the service. Thus, for instance, long waiting times for admission to the system (Appleby, 2002; Ben-Tovim et al., 2007; Laursen et al., 2003; Wessner, 2005); inconveniences, indiscretion experienced during treatment, e.g. waiting in the corridor, in a nightgown (Appleby, 2002); or the same data being queried several times during the treatment process (Tanninecz, 2009). However, many problems affect the patient without the latter being conscious of the deficiencies, due to his position and lack of sufficient information to judge the situation. This type of problems listed in the cases are:

- Lack of organisation (chaos) manifesting itself in the processes, due to the inadequate specification of competence areas (Nelson-Peterson and Leppa, 2007; Braaten - Bellhouse, 2007);
- Inadequate flow of information (e.g. wrong patient identification, wrong indication of the change which took place in a patient's state) (Nelson-Peterson and Leppa, 2007; Tanninecz, 2009) which may easily lead to such errors as wrong medication;
- Inefficient processes which waste the resources (Laursen et al., 2003; Fillingham, 2007; Ben-Tovim et al., 2007; Appleby, 2002), such as redundant tests/examinations;
- Delays in the process (Kim et al., 2006), e.g. delays in testing, in patient discharge (Ben-Tovim et al., 2007), medication (Kim et al., 2006), or: the laboratory tests are not ready by the time of the operation (Jimmerson et al., 2005).

Similarly, employees who do not follow the regulations, e.g. do not wash their hands, put the patient at significant risk in a way that is invisible to the latter (Appleby, 2002).

The processed cases list many further examples of obvious signs of deficiencies, problems, such as the following:

- Cancellation of operations (Fillingham, 2007; Ben-Tovim et al., 2007);
- Over-burdened internal service providers (Ben-Tovim et al., 2007; Powell, 2009);
- Excessive number of hand-over/take-over points within the processes (Taninecz, 2009) and missing or slow feedback (Furman - Caplan, 2007);
- Frequent interruptions of the nurses' work due to external factors (New et al., 2008);
- Wrong layout of the instruments (Nelson-Peterson and Leppa, 2007; Appleby, 2002);
- Waste of the time of the well-trained staff due to search for information, accomplishment of ancillary activities (Kim et al., 2006);
- Misinterpretation of the results of sample tests due to lack of standardisation in the wording (Raab et al, 2006);
- Excessive time allocation due to lack of regulation in the area of X-ray referral (Kim et al., 2006).

The results of the above are reflected in the high number of over-time, high staff fluctuation due to dissatisfaction (Ben-Tovim et al., 2007) and, in general, productivity concerns (Fillingham, 2007) and business management difficulties (Nelson-Peterson and Leppa, 2007; Fillingham, 2007).

The basic literature attributes the above problems to lack of organisation/transparency of the processes and their significantly higher level of complexity than that of the industrial processes (Spear, 2005; Proudlove et al., 2008; Young – McClean, 2008). All that highlights the absence of the process-based approach, lack of reflection on the processes, lack of process planning/design (Ahlström, 2004), excessive functionalism (Mezőfi, 2007; Parnaby – Towill (2008) and the significant influence of patients. The researched cases have confirmed these opinions. 8 of the 17 sources mention the problem of lack of process transparency (16 references altogether) due to several reasons, including high complexity, mentioned with special emphasis (New et al., 2008; Appleby, 2002; Ben-Tovim et al., 2007; Fillingham, 2007; Jimmerson et al., 2004). Taninecz (2009) mentions the mushrooming

of loops and cession points integrated in the processes, whereas New et al. (2008) blame the hospital-level complex bureaucracy matrix and dispersed responsibilities for the various processes for the chaos. Finally, Jimmerson et al. (2004) note that so far the processes as such have not found their way to the focus of attention of hospitals.

It is important to remark that the deficiencies or "errors" described in the foreign cases typically do not relate to the professional expertise and skills of the workers, but rather to the processes, their lack of organisation/transparency. This is witnessed also by the fact that, of the 76 coded remarks, none referred to the professional aspects of the work of the physicians/nurses. Even in case of errors that are closely related to professional work (e.g. diagnostic errors), the central issue is deficient communication between the staff members.

To sum up the comments on the processes and their errors: in the opinion of the authors of the researched articles, **complexity is probably an essential feature of hospital processes, to be taken into account by planning and development. These complex processes become chaotic and opaque because the bureaucratic systems, the dispersed responsibilities and the conflicting interests make them that; and because integrated process planning and management is missing. Communication problems, loss of information, loss of efficiency, excessive workloads, delays, stress, staff and patient dissatisfaction, in turn, are a direct consequence of non-transparency, unclear competence and responsibility areas, fragmented management …** These findings are in perfect harmony with the conclusions expressed in the basic literature.

The outcomes of the developments implemented in the foreign cases as well as ZMK's case confirm the assumption that conscious process management and standardisation can reduce process complexity and lack of transparency and thus also the number of human errors/omissions, and enhance service quality and efficiency.

7.4. The changes

There is no general agreement concerning the factors which provoke the changes. In the UK, Lean is by and large compulsory due to the relevant initiative of the NHS, and, of course, the "external pressure" category predominates. (Radnor et al., 2006). In contrast with the British practice, an earlier Swedish research found that inner motivation was more important. (Jesper et al., 2003). The foreign cases do not discuss this issue. In ZMK's case, both the environmental trends and the line of interest of the young management contributed to the initiation of the developments.

As for the nature of lean transformation, both the basic literature items and the cases identify two clearly distinguishable types:

1. The short development projects (rapid improvement events) are present in many foreign cases. They usually have local (ward-specific) objectives: quality development or the reduction of wastes. Their advantages include relatively simple co-ordination and fast results (Radnor et al., 2006), which are important to maintain the motivation of the staff (Kotter, 1995; Jimmerson et al., 2004). Their disadvantages are the following: they do not think in terms of processes when it comes to development; they do not take into consideration the interests of other, related areas; the results are less permanent; developments take place without coordination, which may lead to too many simultaneous projects, the fragmentation of the resources and the disturbance of continuous operation (Proudlove et al., 2008; Spear, 2005; Radnor et al., 2006). According to the latest surveys, most NHS hospitals belong to this category (Burgess et al., 2009; Radnor, 2009). I met with the same in the majority of foreign cases I analysed during my research.
2. Comprehensive, programme-type Lean (full implementation), the objective of which is to realise "lean operation" and which, accordingly, treats Lean as a strategic tool; in the opinion of the experts, this is the right way to the achievement of sustainable results (Radnor et al., 2006; Grol et al., 2002; Williams et al., 2009; Joosten et al., 2009). However, the experience is that programme-type Lean also takes place through a series of minor projects (Spear, 2005). This is due to the requirement to maintain continuous operation and also to create initial motivation, and to maintain it by showing visible results (Spear,

2005; Jimmerson et al., 2004). This type of development allows to build up a process-centred approach, and it is suitable for the implementation of complex, trans-departmental projects. Both top-down and bottom-up initiatives are present in the creation of the projects (Fillingham, 2007). However, there are only a few examples of this type the world over (Miller, 2005; Spear, 2005; Fillingham, 2007).

The other foreign cases typically describe the implementation of specific projects, but certain references and the background research suggest that these may nevertheless be the parts of programme-type Lean transformation at several places (Powell, 2009; Nelson-Peterson – Leppa, 2007; Furman – Caplan 2007).

Where the changes do not take place under the leadership of the management (top-down initiatives), in connection with the strategy, the projects are started by the "frontline" workers (bottom-up initiatives). The majority of authors, however, make reference to neither of these forms, with the exception of Fillingham (2007) and Jimmerson et al. (2005) mentioned previously. Jimmerson et al. (2005) report on a bottom-up initiative.

ZMK provides a good example of the implementation of continuous, multi-annual strategy-level programmes, which include radical as well as routine development. To date, ZMK already applies institutionalised systems for the development, which contain both top-down projects to achieve strategic objectives and bottom-up ones targeting operational ones. The issue of the system-level application of Lean is a topical agenda item in the hospital.

When speaking about the success criteria of Lean, Radnor et al. (2006) and Spear (2005) actually list what are the typical factors of successful change management in general (managerial commitment, unambiguous target specification, good communication, etc.). From that one may infer that the management of change is a crucial issue also for the hospitals initiating lean transformation. Fillingham (2007) also highlights the importance of managerial commitment. The case of Royal Bolton Hospital shows that managerial commitment greatly depends on the interrelationship of Lean and the strategy, since a strong interrelationship obviously manifests itself in the determination of the objectives and the bonus payments related to their achievement,

the performance indicators and the allocation of the resources, which are the ultimate motivations underlying the attitude of managers. Managerial commitment on the other hand is probably a compelling force in the creation of staff commitment even if the worker is not really convinced of the direct benefits of Lean for his work. On the basis of their experiences at Virginia Mason Medical Center, Nelson-Peterson and Leppa (2007) stress the importance of the presence of managers in everyday care provision. Powell (2009) emphasises the determination of the leadership to guarantee the workers' jobs and the relevant communication. Jimmerson et al. (2005) underline the importance of the active support of managers in the creation and maintenance of staff commitment. **One obvious sign of managerial commitment is (in addition to their presence) is the allocation of the time and resources needed for Lean to the workers taking part in the programme** (Fillingham, 2007).

ZMK provides a good illustration of managerial commitment, intensive communication towards the workers (the flow of information in the opposite direction is less refined), the match between strategic objectives and the performance measurement system, consistent calling to account and full involvement.

In connection with a staff involvement, New et al. (2008) remark that although everyone would like the processes to improve, it is nevertheless difficult to involve the people, because everyone looks on the projects with a certain degree of cynicism. Jimmerson et al. (2005) consider the bottom-up initiatives of change effective, because a successful project of a minor scope may convince people that the initiatives make sense. Furthermore, they mention the invitation of frontline workers and their direct managers to the projects. Fillingham (2007) describes the joint work of medium-level managers and their subordinates in the implementation of developments.

In summary, **the cases suggest that the hospitals do not look on Lean as a programme of change of strategic relevance. Considering the number of positive outcomes, however, it seems that the absence of the strategic approach has no direct impact on the outcomes of lean projects. (At least not in the time perspective under study). As for the issue of managerial commitment and its demonstration, the authors of the cases and the researchers quoted in connection with the basic literature are in full agreement as to their importance as an essential factor which determines the opinion as well as commitment of the staff. In addition, staff members can be committed by involvement in the projects and by being provided**

an opportunity to acquire positive experiences. In regard of the scope of changes, the opinion that developments of strategic importance can be executed effectively by being broken down into many little projects seems to be gathering strength.

7.5. Objectives and scope of lean projects

Owing to the special features of health care services (such as the process-influencing effect of the patients), it is often very difficult to identify the real outcomes of Lean; this is why it is so important to give a clear and measurable definition of the development objectives (Fillingham, 2007). The basic literature, too, stresses the importance of the alignment of the project and the strategic objectives. Ideally the projects are part of the strategic changes (Radnor et al., 2006; Spear, 2005; Proudlove at al., 2008; Young – McClean, 2008). In the foreign cases, the specific project objectives are seldom (in only four cases) clarified. In most cases we have every reason to presume that the projects are not linked to strategic objectives (with the exception of e.g. Royal Bolton Hospital: Fillingham, 2007), but rather aim at providing a solution to local problems (e.g. Raab et al., 2006; Appleby, 2002). There are a few cases where the process-centred approach and a corresponding development are present (Laursen et al., 2003; Jimmerson et al., 2004).

One can only draw inferences as to the spatial and temporal dimensions/scope of the projects from the identification of the project venue and the nature of the described problem and the outcomes. Sometime the projects are limited to the solution of a problem, which occurs at a highly specific place (e.g. absence of standard terminology in the pathology laboratory, Raab et al. (2006)), whereas others try to remedy a problem of a more general kind at department level (e.g. reduction of the number of nosocomial infections; Appleby (2002)). Finally, still other projects target the mapping and the simplification of the journey of the patient through several departments (e.g. Laursen et al. (2003), Jimmerson et al. (2004)). As for the duration of the projects, it is typical to have the so-called "rapid improvement events" known from the industry, that is, to have short, typically 3-5-day-long projects (e.g. Wessel, 2005; Powell, 2009; New et al., 2008) but Jimmerson et al. (2004) describe project periods combined with 7 to 10

weeks of training. The cases do not reveal the preparations for the projects (e.g. data collections), but there are indications that the projects are not terminated with the execution of the RIE, since the outcomes manifest themselves with a certain delay, sometimes after several months.

ZMK's case clearly shows that the strategic changes and the related top-down, pre-planned smaller or bigger projects, and the small projects to solve local problems, initiated from below, are not in opposition but, on the contrary, they complement one another. Major projects are the tools of the execution of strategic changes, whereas minor, ad hoc projects are indispensable for continuous development and everyday problem solution and learning.

The above realisation may ease the tension between the importance of the strategic approach communicated in the basic literature items on the one hand, and the apparent independence of the projects described in the cases from one another on the other hand, since supplementary information available on several hospitals suggests that the two systems can coexist this way (e.g. Virginia Mason Medical Center, Flinders Medical Center). Nevertheless, as far as the hospitals are concerned, one may raise the question asked also by Young – McClean (2008), namely *to what extent the objectives of the projects correspond to the ideals of Lean.*

7.6. Management of lean projects

According to the research results, the organisation of lean projects implemented in the hospital context is significantly similar to those realised in the industry. The projects take place with the participation of staff and managers employed in the area concerned, in the form of team work. The participants of the projects include nurses, physicians, and workers in the supporting areas (New et al., 2008). The team makes the analyses and formulates its proposals for the future collectively (Shannon et al., 2006). The project work activities include initial training (Powell, 2009); development of the problem sensitiveness of workers (Braaten -Bellhouse, 2007); identification of patient needs (Fillingham, 2007); detailed mapping and observation of the topical processes; exploration of the causes of the problems and their elimination based on the general

rules of process design and, finally, specification of the future design and development of the processes. During the projects, the participants are motivated mainly by the possibility of upgrading their own work (Jimmerson et al., 2004; Braaten -Bellhouse, 2007). Another motivating force is that their direct managers encourage them to work out their own development ideas (Fillingham, 2007), and that they enjoy the support of the upper management who demonstrate their interest in the projects (Fillingham, 2007). The projects are assisted by an internal trainer-consultant or an external consultant (Powell, 2009). Furthermore, it is necessary to provide for the resources (Fillingham, 2007). Jimmerson et al. (2004) make special reference to the fact that considerable emphasis is put on the involvement of the medical staff in the projects.

At ZMK, the key issue of the systemic, large-volume projects was to convince the staff (especially the doctors). Apparently, it still is, at least as far as further progress is concerned. Although the course of the projects has been standardized, their efficiency seems to lag behind the corresponding results of the "rapid improvements". In ZMK, as opposed to the typical practice in the foreign hosptals, initial training is not part of the project. In regard of the nature of the other details, there are no significant differences.

In summary, the projects are usually "rapid improvement events" implemented with the involvement of staff employed in the area concerned, with the assistance of experienced external or internal professionals, in cross-functional groups (Radnor et al., 2006; Spear, 2005). Although the case descriptions contain little information in that respect, the experiences communicated by the processed cases are in good agreement with those relayed in the basic literature items. Project-level success criteria include precise target setting, motivation of the participants (e.g. by the model example of the managers, and the possibility of expressing their opinion), the allocation of the necessary resources, the active participation and interest of the managers. It seems that winning the support of the doctors is of outstanding importance for success.

7.7. Lean tools

One of the most frequently discussed issues in the papers on the lean transformation of hospital processes is the description of the principles, tools and solutions applied during the projects. Its importance is clearly reflected also in the writings analysed under the research; every author describes the applied tools, for example, in the articles which describe the foreign cases, their occurrence frequency is high as compared to the other factors: they represent the third most frequently mentioned factor. According to the research of Radnor et al. (2006), from among the sources listed in the basic literature items, the frequency list is headed by the tools of exploration and elimination of the seven forms of waste, and by process mapping.

According to the basis of the basic literature, the most important questions concerning the tools are the following:

- What principles do the hospitals apply during their lean transformation?
- What industrial tools did the hospitals take over without modification (with little modification) and what did they adapt?
- What special solutions have been invented?

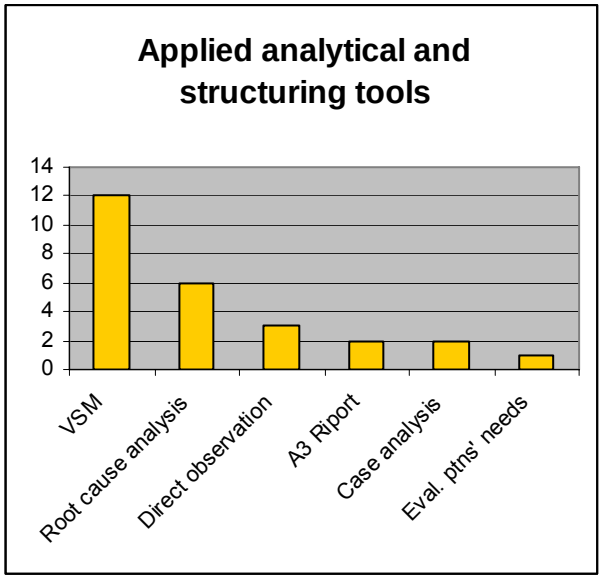
Although the present research can only answer the above questions in part, a number of important comments can be made. To analyse the applied tools, I mainly relied on the foreign case descriptions, which I compared to information, propositions contained in the basic literature and to the experiences of Zala County Hospital. **Consequently, in what follows, the results of the analysis of the foreign cases will occupy the foreground.**

The case descriptions mention many tools, but they seldom use the terminology of the Lean literature. The exact description of the tools is usually missing; it is indicated by one or two extended sentences.

There are a few exceptions to the rule, as in the case of the A3 report or the preparation of the value stream map (VSM), the use of the 5 whys and of the cause-effect analysis. This is probably explained by the fact that the latter are much more the tools of data analysis and representation than of process organisation, and as such, they

can be applied more easily to a new context. Nevertheless, several remarks by Jimmerson et al. (2004) suggest that even these tools need to be adapted to the context ever: *"We adapted Toyota's more advanced A3 reporting system to healthcare…"* (p.8.). In my opinion, it is worth investigating the analytical and display tools apart from the other tools, due to their easier adaptability. The frequency of references to the application of analytical tools is shown in Figure 13.

Figure 13: Frequency of references to the applied analytical and structuring tools



Note: For an explanation of the terms, see Table 6.
Source: Figure compiled by the Author.

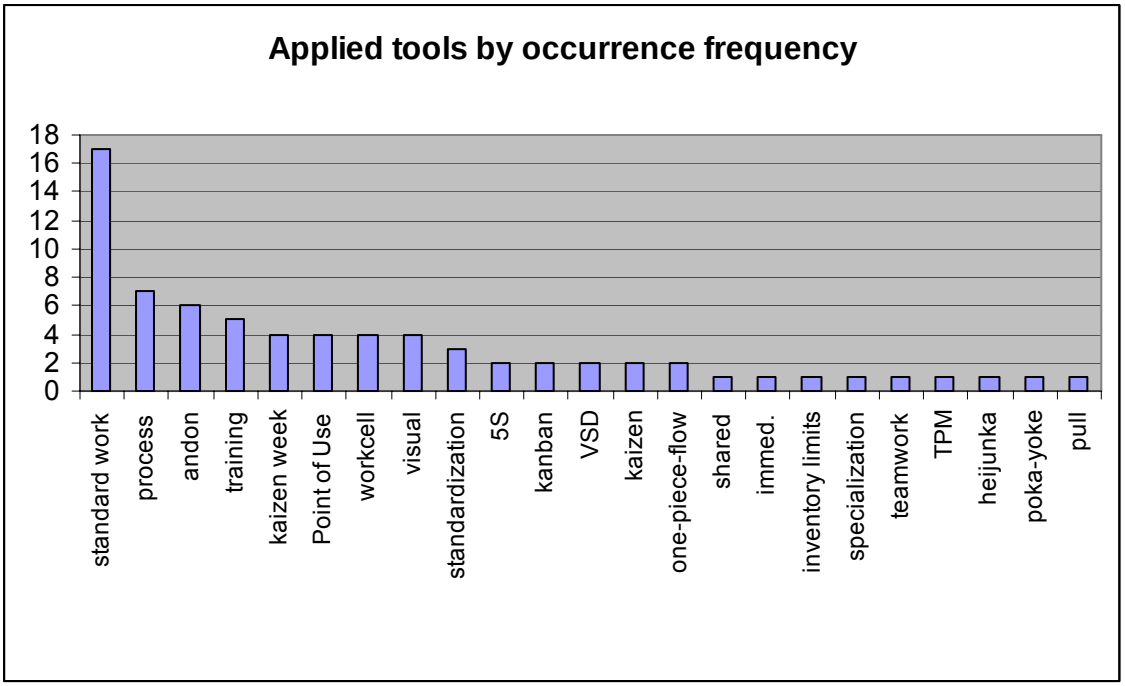
Value stream mapping was the analytical tool mentioned most frequently in the case descriptions. This shows the presence of the process-based efforts and/or the steps taken to deploy it. The experiences of Radnor et al. (2006) confirmed the top ranking in terms of occurrence frequency of VSM. Jimmerson et al. (2004) suggest that the mapping of the value streams (VSM) is easy to adapt to any hospital context, and it is well applicable to process reviews and the selection of points in need of development. The other frequently mentioned tool is the **cause-effect analysis** with the help of the techniques of the fishbone-shaped **Ishikawa diagram a**nd the **5 whys**[24]**"**. This is a common tool of problem exploration, not necessarily linked to Lean. Direct observation helps make the process map or analyse the errors. **A3 reporting** is a tool taken over from Toyota, adapted personally by Cindy Jimmerson who, according to the relevant

[24] The essence of this technique is to explore the underlying, deeper, causes of the phenomena, to identify the causes behind the seemingly trivial answers through five levels.

reports, applied it with success on several occasions. She wrote a book based on her experiences (Jimmerson, 2007). Jimmerson et al. (2004) depict also the advantages of the A3 report: it helps present the situation objectively, and hence it is especially beneficial in solving inter-departmental issues; it helps discuss emotionally sensitive debated issues in a relaxed way. Nevertheless, no other author mentions the application of this tool. Case analysis is actually part of problem exploration. The "assessment of patient needs" refers to an analytical tool here (mentioned on a single occasion!), but according to the logic of lean management, it should be an integral part of everyday operation.

Figure 14 shows the frequency by type of the tools I linked to the solutions mentioned in the case studies. As can be seen, several lean tools and the underlying conceptions must have been applied in the 20 cases I processed. However, the relatively low number of occurrences is indicative of the fact that a few tools at best are generally used, whereas the rest appears in the case descriptions sporadically only.

Figure 14: Lean tools by occurrence frequency



Note: For an explanation of the foreign terms, see Table 6.

Source: Table compiled by the Author

This state of affairs supports the hypothesis that **the hospitals concerned are generally in the beginning of the lean process, and they have a long way to cover yet until lean management grows into a system which has recourse to dozens of tools and permeates the operation of the organisation.** The general validity of this statement is weakened by the fact that the signs are that there are significant differences between the lean efforts of the hospitals figuring in the various cases. Indeed, the focus and scope of the cases covered by the publications may also have been different. Obviously, less tools can be used in connection with a problem of minor relevance. A complex solution is shown for example in the case of Virginia Mason Medical Center (Nelson-Peterson and Leppa, 2007), where a total of 8 tools are mentioned on a total of 10 occasions in connection with a 27-bed ward (andon, JIT, kanban, on-piece flow, stock at the place of utilisation, standard operations, team work, work cells). Raab et al. (2006), on the other hand, mention a single tool in the case study of University of Pittsburg School of Medicine, Shadyside Hospital, where the precision of the examinations was developed through the standardisation of the terminology in the pathology department. However, other lean developments are also known to have taken place in the same hospital (Spear, 2005).

In connection with the presentation of the applied tools, I must emphasise that these are probably no longer the "classical" lean tools, but the results of the application of the underlying conceptions to the hospital context. Therefore, in what follows I shall use the term "tool" in that sense.

A survey of the application frequencies surprisingly reveals the predominance of the standardisation of the activities (standard work). It can be inferred that, in addition to process re-organisation, the hospital processes are organised in line with the industrial approach: the processes are thought over, the activities are regulated precisely. This is fully compliant with the lean approach. **The phenomenon warrants special attention because the most frequent argument against Lean is that hospital care cannot be standardised, because it deals with people and every person is different. Of course, I shall not debate that, but the cases show that it is nevertheless possible to standardise the activities.** What is more, as mentioned in the writing of Fillingham (2007), Director of Royal Bolton Hospital: *"standard work is no other but what we used to call effective clinical practice in the past. ...The trick is not just to identify it, but to embed it so it is carried out consistently on a daily basis…*" (p.

237). That is, the application of standards is not alien at all to hospital-based patient care.

Seeing the many examples of broken processes in the cases, the intensive effort on reorganising processes is understandable and also expected. Moreover focusing on processes and their improvement fully matches the interests of Lean, hence we can just hail the frequent use of this tool.

"Andon", which occupies third position, means, in general, the suspension of service of objectionable quality –in specific cases the termination of any activity which implies a danger to the patient –, and the reporting of such circumstances. In view of the saddening statistics on the number of undesirable hospital events, this is clearly a welcome event.

I shall dispense with the detailed analysis of the remaining the tools. The essential thing about them is that **the approach they embody conforms to the spirit and industrial practice of Lean**, but they are applied in the hospital context.

Moreover, it is worth highlighting the general experiences provided by the cases concerning the characteristics and applicability of the various tools:

- Error-proofing may seem simple, but the hospital workers have become so used to co-existence with the problems that the latter virtually go unnoticed by them (Braaten -Bellhouse, 2007).
- The workers of the laboratory, the pharmacy and the IT teams, respectively, usually understand the objective and course of lean changes easier than others. Jimmerson (2005) attributes that to the fact that they already command a certain process-based approach and they can also find time more easily to execute the changes. In contrast, those who work in the nursing areas find it more difficult to cope with the problems concurrent with change without organised assistance.
- New et al. (2008) call the attention to the difficulties of communication in team work and change management. If the staff work in shifts, there is only the 20-minute break between the shifts to talk to everyone, but many other topics must also be fitted into that interval and actually part of workers are completely exhausted by that time. This hinders joint work and it protracts the time needed

to introduce changes in a redundant and drastic way. Therefore, it is difficult to maintain the enthusiasm needed for the projects.

The tools and the problems encountered during ZMK's almost 20-year history of quality and process development efforts, albeit not identical with the above in every respect, are nevertheless in agreement with the explanations presented here.

To sum up: since the researched hospitals apply but a few lean tools, they are probably far away from the application of the comprehensive management system. So far **typically the analytical and structuring tools (VSM, process reorganisation, standardisation of activities) and solutions to identify and block errors at the moment of their occurrence (andon) are applied. The tools used in the cases concerned are already new versions of the originals adjusted to the hospital context. The specific tools are not necessary compatible even within health care. In the beginning, the various departments execute the changes at different paces. This is partly attributable to the degree of process-orientation, time available to the stakeholders collectively and sensitiveness to the problems. These findings support the previous theory, namely that the adapted versions of the industrial solutions will stand their ground also in health care.** The questions asked in the summary of the literature are partly answered in the case analyses. However, the detailed description of the application of the tools and the specification of the limits of their applicability are still missing.

7.8. Lean outcomes

It is partly attributable to the expectations concerning Lean that every author tries to highlight its outcomes. The explanation is similar to that of the tools presented above and it is understandable, too: for practice, the key issue is probably the demonstration of the attainable results, and the society of researchers is also increasingly interested in that topic. However, according to Fillingham (2007), due to the intangible outcome of the service and the active role of the customer (patient), one of the most problematic

tasks in health care is the unambiguous definition/statement of the results. This problem seldom appears in the writings.

In addition to the general description of the types and nature of outcomes, the papers presented as basic literature highlight the importance of negative cases. This is important for the methodological reliability of the research. Surprisingly, however, Lean has almost only positive outcomes according to both the basic literature and the case studies. In the 20 foreign cases, I found no more than 4 negative remarks, in connection with three cases. I think it is justified to present these in detail:

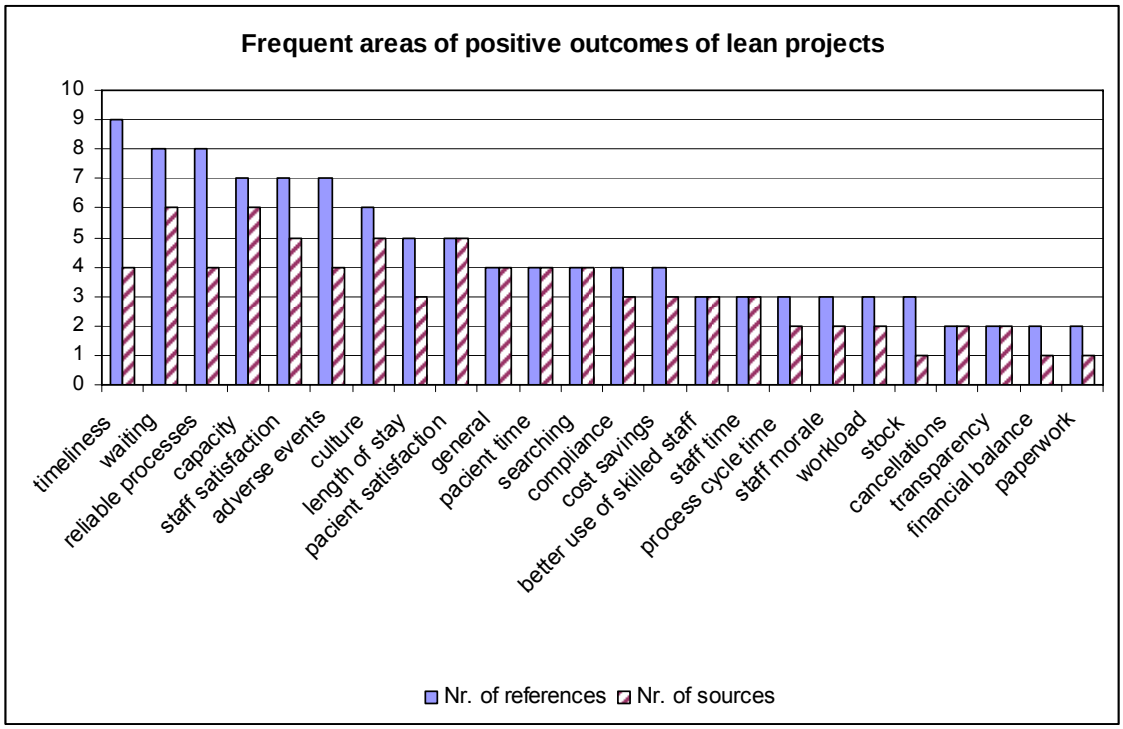
- Raab et al. (2006) observed in a pathology department that under the effect of the standardisation of the terms used to evaluate the samples, the rate of non-diagnosable samples increased. They did not explain the phenomenon.
- Two of the 4 occurrences belong to the same case. Furman - Caplan (2007) note in connection with the operation of the patient security signal system introduced by Virginia Mason Medical Center that, since the system documents treatment errors, the recorded information may be used by the patients and their relatives in occasional litigations against the hospital. For the same reason, the institution will be more exposed to press attacks and negative press appearances.
- The fourth comment is made by Laursen et al. (2003) in relation to a Danish hospital. The essence of that is that even if the hospital keeps improving its efficiency and provides for more patients from the same budget, that makes sense only if it can have its increased performance acknowledged by the financier. If, however the hospital receives funding calculated on the basis of performance in the previous years, as is the case in the Danish quota-based financing system, it may happen that the patients treated by the extra capacities created as the outcome of Lean no longer fit into the predefined quota and hence the relevant expenses are not be borne by the financier. That is, **the quota system may in effect penalise efficiency-enhancement initiatives such as Lean.**

As can be seen, of the four negative outcomes of Lean, only one is a fact – albeit its cause is unknown –, whereas the other three are only assumptions. Nevertheless, it is most important to highlight these possibilities to hospital managers and those who work out the financing systems. As for the legal consequences, Furman - Caplan (2007) themselves are of the opinion that the negative effect is a necessary sacrifice if patient

security is to be improved, and it will decrease with the development of the institution. The experiences of Spear (2005) support this expectation. Openness, on the other hand, may increase the trust of the patient in the institution and, all in all, higher turnover and market price may offset the occasional negative effects. The Danish quota-based financing system is actually a hindrance to the determination of "customer value" based on market principles. This may be a fundamental problem in every hospital which is part of a financing system of this type.

Figure 15 shows the types of positive outcomes of Lean in the foreign cases. The nature of these outcomes is most similar to that of those in the survey of Radnor et al. (2006). I indicated 24 outcome-types in the figure, but the authors mention at least once another 10 positive outcomes. I marked in the figure the area and number (of references) of improvements (e.g. reduction of delays, capacity enhancement etc.) and the number of sources which referred to that type of outcome. The two figures in combination may provide a more differentiated view of the weight of each outcome type.

Figure 15: Frequent areas of positive outcomes of lean projects



Source: Author's figure

The two data series project the following "typical" frequency order (albeit it is not my declared objective to establish such a rank order, it helps present the outcomes).

1. Decrease of patient waiting time (shorter waiting lists, shorter waiting times during treatment)
2. Enhanced capacity of treatment units due to the elimination of redundant activities, wastes. E.g. the number of examined patients doubled (Wessner, 2005).
3. Higher staff satisfaction and lower staff fluctuation due to the reduction of disturbing circumstances and the stress (fluctuation dropped from 20% to 4% according to Braaten -Bellhouse, 2007)
4. A change in culture occurred in several cases: the staff became more sensitive to the occurrence/possibility of occurrence of problems and responded promptly to deter them
5. The previously typical delays diminished at several places, in a way that could be connected to enhanced sensitivity to problems. For example, the delay in the execution of interventions fell from 43 minutes typical previously to 10 minutes (Jimmerson et al., 2004).
6. The significant increase of process reliability is also relatively frequent; for example, in pathology, the rate of results diagnosed erroneously as being negative fell from 41.8% to 19.1% (Raab et al., 2006).
7. The decline in the number of undesirable events (marked drop in the number of infection cases (Shannon et al., 2006; Appleby, 2002) and increase in the number of alarms (over 4 years, the number of alarms underwent 76 fold growth (Furman - Caplan, 2007) to prevent them is probably also related to enhanced sensitiveness to problems.
8. Increased patient satisfaction is indicated as outcome on 5 occasions. They were provided more information; they were exposed to less stress (Laursen et al., 2003); they had to call the nurses less often (Nelson-Peterson and Leppa, 2007); at the time of the first contact-making, they had 90% chance to be able to make an appointment (Taninecz, 2009).
9. Thanks to Lean, the search for instruments and documents came to an end (Nelson-Peterson and Leppa, 2007; Jimmerson et al., 2004; New et al., 2008), and the proportion of cases where every instrument, material

needed for therapy was available already at the moment the need was incurred; rose from 5% to 65% (Taninecz, 2009).

10. Presumably, it is possible to relate to other outcomes the remarks that the staff have more time for patient care than before. For example, in the clinic, the physician/patient time increased from 240 to 285 minutes (Taninecz, 2009)
11. Logically, the decrease of in-patient time by as many as 33% can be connected to many other outcomes (Fillingham, 2007). Shannon et al. (2006) attribute it to the decrease of the number of hospital infections, whereas Ben-Tovim et al. (2007) to the elimination of jams.

I shall dispense with the detailed presentation of further outcomes, but let's quote a list to illustrate what types of outcomes are mentioned by the authors:

> *Growing adherence to the rules; cost-savings; better exploitation of the time of skilled workers; time saved for workers (e.g. for breaks); decrease of process execution times; improved staff morale; decreased workload of departments; decrease of stock levels, or urgent stock orders, of idle stocks; decrease of cancellations of operations, patient appointments; restored financial balance; less administration; better communication between the staff members; more balanced workload of physicians; lower mortality rate; lower number of process steps, simpler processes; enhanced productivity; smaller number of inevitable error corrections; shorter preparation time; team work established; much better understanding of patient needs by the hospital; vision of the hospital specified.*

Similar outcomes were reported during the processing of ZMK's case (stabilised business management, process transparency, efficiency enhancement).

The almost exclusively positive nature of the outcomes, as illustrated also by the above, is a surprising result, worthy of further research. ZMK's case helps line up further potential explanations of this phenomenon: (1) the phenomenon conceals the advantage of the methodology: team work and the presence of all (essential) stakeholders during the development allows to pay attention to potential negative effects already at the time of the specification of solutions and to eliminate them or look for solutions of other types. Since this explanation assumes prudent team planning and project management prior to every project – what seems to be rather unrealistic –, it is

commendable to look for other explanations as well. (2) A further explanation might be the many errors, the elimination of which obviously yields positive results in every case, since it is in the interest of all concerned. Of course, neither can be exclude the hypothesis of Elkuzien et al. (2006), namely that, over and beyond the rosy reports there are also some fiascos, of which no reports are drawn up. This, however, seems to be contradicted by the negative instances mentioned in the cases (Laursen et al.,2003; Raab et al., 2006; Furman – Caplan, 2007;) and in Jenei et al. (2008), where despite the appearance of factors hindering development, the projects managed to produce positive results. Although the negative effects in these cases were also short-term ones, which may then reverse and become positive, in the opinion of Radnor et al. (2006), the **projects designed originally to save costs or reduce staff typically failed to achieve their goals.**

According to the basic literature, time needed to produce the results and the sustainability of the latter are also essential issues.

The time demand of the results is indicated clearly in a single case, by Jimmerson et al. (2004). Here the reports had arrived from pathology to the physician responsible for treatment in five days previously, and the idea was to reduce that to two days. To realise that target, two months were needed (Jimmerson et al., 2004). As for the other case, it is not revealed how much time was needed to achieve the described results. There are only references to part of the development being realised over one-week (five-day) rapid improvement (kaizen) weeks (New et al., 2008; Powell, 2009). This, however, does not tell what further action was needed to achieve the described results. In addition, New et al. (2008) note in connection with the nursing project of an emergency surgical department that, due to the short time available for communication, the execution of the changes "*took a surprisingly long time*" (p.7.). This remark calls the attention to the fact that **the nature of health care, its organisational properties, may also exert some influence on the execution time of changes, and as a consequence of that, on the time needed for the results to manifest themselves.**

Specific information on the sustainability of the results is also scarce. Shannon et al. (2006) write that the number of infection remained low for another 34 months following the introduction of the developments, and according to Appleby (2002), no nosocomial infection occurred at the surgical department of VA Medical Center for four

months after the measures. Another four sources speak of the conditions required to avoid "restoration", i.e. to sustain the results. Jimmerson et al. (2004) and Nelson-Peterson – Leppa (2007) are of the opinion that the participation and presence of the members of the management in the changes is the guarantee of the results. Fillingham (2008) attributes the same to the commitment of group head level managers, whereas Appleby (2002) stresses the problem solving and analysing role of the group head.

In summary, **both the basic literature and the practical experiences list many different positive result types of Lean. The majority of results can be conceived of as components of a clearly definable logical system – a system that matches the essence of Lean. This logical system focuses on improving process reliability, and on decreasing errors and redundant work. These, in turn, improve many care provision indicators (treatment time, number of inflections, patient time etc.) and, indeed, the situation improves also on the care providers' side (less stress, lower workload, more time). All that enhances both patient and staff satisfaction and, not in the least, it has a beneficial effect on the financial balance. The research has demonstrated that – as expected – Lean may also have negative outcomes. However, it seems to have demonstrated also that their number is but a fraction of the positive ones. There are some disadvantages which are inherent in making the errors explicit on the one hand and in operation in a financial context which does not support efficiency increase on the other. As for the time demand of Lean and the sustainability of its results, the propositions expressed by the basic literature have again been confirmed: given the specifics of hospital operation, Lean takes more time than in the industry. The sustainability of the results seems to depend strongly on both the commitment of group-level managers and the presence of the upper management in the projects of change and during everyday operation.**

I found no answers in the case analyses to either the questions concerning (1) the relationship between the objectives and the results and (2) the development of the results in terms of time, or to (3) the rate of success of the implementation of the changes.

7.9. Resources and capabilities

In the researched cases, few references are made to the material and human resources. Jimmerson et al. (2004) describe their experience that initial developments require relatively little material expenditure; the take up staff time instead. This is line with the experiences of Spear (2005) and Radnor et al. (2006). Fillingham (2007) presents the efforts of the management to allocate sufficient time and resources to project participants. Such efforts presume the strategic significance of the developments and the commitment of the management.

Human resources factor gains importance as point of initial deficiencies (marked staff fluctuations), or as constrain of change (e.g. initially overloaded staff).

The picture projected by the analysed sources on HR is that Lean absorbs staff time on the one hand and liberates it on the other. However the problem is that the losses and gains do not necessary manifest themselves at the same person. Lean has a beneficial effect on the conditions of work (e.g. less stress, more time for workers to do their tasks, to have breaks, etc.), and that is conducive to enhanced staff satisfaction.

Several authors mention that both training delivered during the lean projects and first-hand experiences of the process of problem solving improved the competencies of the staff and, consequently, the HR quality of the hospital (Jimmerson et al., 2004; Powell, 2009). Initially, the employees of the different wards (e.g. nurses vs. laboratory staff) understand the essence and methods of the developments to different extents (Jimmerson et al., 2004). Presumably, this difference slowly disappears with the growth of the number of projects– due exactly to the development of the individuals' capabilities.

7.10. Organisational structure

Although organisational structure is apparently not closely related to processes development, it has a significant effect on the possibilities of lean development. For, organisational structure is partly the reflection and partly the shaper of organisational culture, which determines the distance between the lean principles and the effective

principles of the operation of the organisation. A structure based on the dissociation of the functions, on departments/wards, which distinguishes many hierarchical levels and is burdened by extensive bureaucracy will hinder the spread of the process-centred approach and hence also the effectiveness of Lean (Spear, 2005, Radnor et al., 2006; Ahlström, 2004; Hellström et al., 2009). These propositions are confirmed by the relevant statements in the foreign case studies. A new component of the organisational structure has also come to the limelight during the analysis of the cases. New et al. (2008) stressed the negative effects of working in shifts and the resulting separation of the persons concerned in terms of time on the introduction of changes. Although this has only been mentioned once, in my opinion, this problem is really important for change management, even if it is not necessarily a distinctive feature of health care.

In ZMK case, one perceives a gradual move away from the classical, hierarchically structured bureaucratic system and progress towards a process-oriented organisation, but the existing deficiencies project a long way to cover yet.

Despite every advantage of a process-oriented organisational structure, drastic changes are not commendable, for they may hinder operationality (Hellström et al., 2009).

7.11. Organisational culture

The "blaming culture" prevalent in hospital organisations is a significant obstacle to Lean, since its approach is diametrically opposed to the lean way of thinking (Spear, 2005). According to the blaming culture, it is the task and responsibility of the medical and the nursing staff to cure people. Therefore, if an error is committed, it is the responsibility of these individuals; the error is due to their incompetence (Furman - Caplan, 2007). The revelation of individual errors is hindered by the fear of the management from damage claims (Furman - Caplan, 2007), and the fact that persons who occupy a lower hierarchical position feel dependent on those above them, and are therefore reluctant to reveal errors committed by them (Shanon et al., 2006). The accepted behaviour is therefore to hush up the errors and to bypass the problems, not to explore and eliminate them. Since this inevitably leads to the recurrence of the

problems, the workers begin to feel they are natural and normal, necessary concomitants of care provision, and after a while they actually go unnoticed (Braaten - Bellhouse, 2007). This mindset must be transformed by Lean so as to make error-proofing the accepted norm.

ZMK's case confirms the existence of the blaming culture, but it also highlights that no uniform, only a typical, culture exists. Therefore, there will always be some who are willing to act to promote the developments.

The contents of the cases and the experiences of ZMK show that excessive insistence on medical autonomy is, firstly, a superfluous hindrance to lean development (Shannon et al., 2006) and, secondly, it is contrary also to the application of the care provision standards (Fillingham, 2007).

The level of group/team leaders has a significant and direct effect on the creation of the outcomes of Lean, but success nevertheless depends on the attitude of the upper management. Without their commitment and support, Lean can only be a short-lived and isolated local initiative (Radnor, 2006; Fillingham, 2007). In ZMK's case, many initiatives are thwarted at department head level, due to the strong bargaining position coupled with lack of motivation of professionally excellent physicians.

Resistance to change (Jimmerson et al., 2004) may be due to natural aversion to what is unknown or to excessive regulation (Nelson-Peterson – Leppa, 2007), to disdain concerning management tools applied in the industry (Laursen et al., 2003), automatic rejection of tools taken over from the industry and, as indicated already, the typical organisational thinking (Kim et al., 2006). The experiences suggest that initial resistance and aversion may be altered by participation in the events and by awareness of the outcomes (Jimmerson et al., 2004; Shannon et al., 2006; Nelson-Peterson – Leppa, 2007; Powell, 2009).

The real owners of power play a major role in the prevention and elimination of resistance: the attitude of the managers determines that of their subordinates (Fillingham, 2007, Appleby, 2002; Jimmerson et al., 2004). Managers must delegate the responsibility of decision-making to the workers; their role is to define the reference framework, to support the projects and to call to account concerning the results (Ben-Tovim et al., 2007; Jimmerson et al., 2004). Building on the common values of the

organisation may be a motivating tool. The common value itself may be "ideal patient care" (Braaten –Bellhouse, 2007) or, as in ZMK's case, patient satisfaction, or the "vocation", i.e. the enrichment of the professional content, professional quality of the work.

Organisational culture thus affects the possibilities of Lean and vice versa. The closer the actual culture of the organisation to that of a lean (learning) organisation, in which the identification, analysis, and elimination of mistakes and the process approach, are part of everyday activities, and close co-operation between the various professions is the norm of operation, the more effective Lean will be. This (its practical manifestation) is what Radnor et al. (2006) call organisational readiness, which can be assessed prior to the launch of lean development, and on the basis of which one can estimate the time perspective and resources demand of the implementation of Lean.

7.12. External support

ZMK's case clearly shows what problems and possibilities are to be reckoned with when the hospital managers want to adopt industrial management methods which are unknown to them:

- Adoption of tools tested elsewhere promises faster success, for it offers solutions the development of which might take decades in their own area.
- Since the hospital has no experience and expertise for using old tools in new areas, it either spends years to acquire them, or has recourse to external assistance.
- If no experience is available on the application of industrial tools in hospital care, then the development project probably will consume more time than a traditional industrial project, as the external experts themselves must also adapt to the different circumstances.

As is obvious from the above, the efficient solution for the hospital is to use external assistance (Radnor et al., 2006; Proudlove et al., 2008) – as did ZMK. However, due to the scarcity of experiences concerning Lean in hospital processes, a hospital cannot spare learning, not even if it has external assistance. The basic literature items adopt a clear position in favour of the use of external assistance, and beside the experiences of ZMK, the foreign cases also refer to it at several places (Powell, 2009). Action research or action learning is a special methodology which allows the hospitals and the external experts to learn jointly (Coughlan – Coghlan, 2002; Jimmerson et al., 2004; Laursen et al., 2003; Jenei et al., 2008).

8. Summary

The aim of the dissertation was to provide a systematic overview of practical experiences related to lean initiatives the objective of which was to eliminate high and growing costs, complexity and lack of organisation, and the resulting wastes and treatment errors typical of the service provision processes of hospitals.

First of all I discussed the necessity of the application of process development and lean management in health care; then I described in short the basic ideal of Lean and its components. Then I moved on to the discussion of the conception which triggered the Lean development of health care services. The second part of the paper was meant to present practical experiences mediated by the technical literature on the application of the principles of lean management to the development of health care services. To create a framework of analyses, I identified studies which themselves provided a synthesis of the experiences of several lean cases, and then I designed a code system based on their content.

I essentially used two groups of sources to obtain information on practical experiences. On the one hand, I used the already published scientific research results; on the other hand, I made a case study research of the experiences of a Hungarian hospital. Then I classified the collected empirical evidence with the help of my code system, and I presented that in the second part of the dissertation.

Although the 20+1 cases processed here can by no means regarded as being representative of the hospitals of the world (the US, or Europe) they nevertheless reveal many experiences in regard of the lean transformation of health care (especially hospital) processes. Although the results so obtained can only be generalised to a very limited extent, they can provide a basis for further research which may confirm or refute the general validity of the experience related here.

Several authors have expressed their doubts concerning the applicability of lean management and its tools in the non-productive area (Liker, 1998). For, presumably in health care as well as in the non-productive activity of the producers companies, the applicability of tools developed for the management and organisation of productive activities is highly limited by the differences of the areas concerned. Sobek and Jimmerson (2003) deem the application of the lean system in health care cumbersome.

They justify that by saying that although the philosophical elements of the system can be interpreted in general for any activity, the philosophy itself does not provide sufficient guidance for specific action: for example the elimination of wastes is an objective which is understandable to all, but its concrete steps are much more difficult to specify. However, as demonstrated in the dissertation, some organisations have managed to produce significant results through the application of lean principals and tools.

One of the main messages of the 20+1 cases is that, in reality, the hospital processes and activities are not so very different from other service or even production activities as to be unsuitable for the application (with adequate adaptation) of lean thinking and the many tools developed by Toyota. This conclusion is in agreement with the conclusions Radnor et al. (2006) "**Some components of the Toyota Production System can be used to develop the health care activities, but no success is to be expected from the simple adoption of the tools concerned, without their adaptation to the specifics of the target area."** (Radnor et al., 2006, p.1.).

The projects described in the cases concerned many areas, from administrative activities through the sterilization process and the laboratory tests to the patient classification system of emergency care units and even the insertion of catheters. None of the papers reported such process characteristics as would have made it impossible to apply the basic principles (e.g. establishment of continuous patient flow, standardisation, fast information flow, etc.). This circumstance and the many different application areas warrant the conclusion that the developments do not have to be limited to the supporting processes, but they can also concern ward-based treatment or the organisation and efficiency of the operating theatre. It seems that the fact that the patient takes part in the process, and even "speaks back" is no cause for concern, but rather helps explore the expectations and identify the potential problems.

Hospital activities, however, have some features that are really different from those of the industrial context, but which are important for the planning and methodology of lean projects, and cannot be assigned to the cultural factors. One is the complexity of the processes and the organisation. Thus, for example, in a general hospital, one point (e.g. a surgical ward) may be connected to so many processes and activities that the ideal process is not obvious and its design is a complex task. Furthermore, complexity aggravates change management. Therefore, it may be

necessary to develop new project management tools in the future to overcome these challenges.

Furthermore, the experiences so far have shown that most developments still concern the accomplishment of the first three steps of lean thinking (Womack – Jones, 1996), thus the identification of customer expectations, process mapping and the end-process "straightening" that is, the realisation of obstacle-free patient flow. This is most often accompanied by 5S, a basic tool of the establishment of cleanliness and order, and the establishment of standard work processes. One may draw three conclusions from that: (1) health care is really at the beginning of the transformation process; (2) during the transformations, the principles and methods accepted in the production area are insisted on; (3) the principles and methodologies known already can be applied in this context as well.

The cases also reveal that the counter-arguments raised on the occasion when lean principles are first introduced to health care workers do not represent a real problem in lean transformation if the organisational culture can be transformed so that, instead of the feudalistic, bureaucratic and hierarchical system, a co-operative approach which promotes communication between the various groups and the professions, focuses on the patient and the processes, should prevail. As a matter of fact, one could say that the development of organisational culture and of the thinking of the management is imperative anyway in health care, irrespective of the lean efforts, and the existence of an established "modern" culture will actually significantly accelerate lean transformation (Radnor – Walley, 2008).

Part of the experiences and findings listed in the dissertation can be interpreted also in general; thus for example the commitment of the senior managers is of outstanding importance in any significant transformation process (Kotter, 1995; Bakacsi, 1998; Losonci et al., 2007), or the transformation of the culture of the organisation and the involvement of the workers are generally important for lean transformation (Miller, 2005). Table 11 shows the differences between traditional western culture and Lean culture. Lean culture attempts to attain the perfect state which it defines by the needs of the customers and a process-governed system without wastes. It sees the solution to that co-operation and the exploitation of individual knowledge.

Table 11: Comparison of traditional and lean culture

Traditional culture	Lean culture
Function silos	Interdisciplinary teams
Managers direct	Managers teach/enable
Benchmark to justify not improving: "just as good"	Seek the ultimate performance: the absence of waste
Blame people	Root cause analysis
Rewards: individual	Reward: group sharing
Supplier is enemy	Supplier is ally
Guard information	Share information
Volumes lowers cost	Removing waste lowers cost
Internal focus	Customer focus
Expert driven	Process driven

Source: Byrne – Fiume (2003), cited by Miller, 2005, p. 5.

However, one cannot over-emphasise the importance of the transformation of organisational culture in the case of the healthcare organisations. For, here not only the traditional mass production approach must be transformed into another production philosophy, but the concept of "value", "stream" or "waste" must also be re-defined in a system which has been organised and evaluated from the beginning of its existence on the basis of other principles.

That is to say that the transformation of health care organisations based on the lean approach, and the change in culture required for that, will take significant time and energy and, last but not least, professional expertise on the part of the persons at the head of the changes even in comparison with the industrial organisations.

I sincerely hope that awareness of the factors explored in the dissertation will contribute to the successful implementation of (lean) organisational changes, since *"Changes taking place at the level of the organisation are promoted and hindered by numerous factors, without the recognition and adequate treatment of which the change of the organisation cannot be effective*." (Szócska et al., 2005, p.190.).

In terms of the typology developed by Radnor (2009) and on the basis of the research results, to date a large part of hospitals is in the bureaucratic phase of Lean at the most; some may be already in the "proactive" or the "understanding" phase but, even globally, only a few have got to the "productive" stage. This course of development is influenced by many factors.

One of the most excellent Hungarian representatives of developments, Zala County Hospital, is no doubt over the bureaucratic stage and proceeds with the development in a "knowing" manner. The goal of the hospital might be to get to the "productive" phase, which would require a more detailed understanding of the Lean tools and way of thinking.

8.1. Scientific relevance of the research results

The research results presented in the paper will be important, primarily, for the community of researchers, given the fact that, in a way that is unique to this topic, they are based on the in-depth analysis and systematic description of information contained in 20 cases originating from 17 sources. For this reason, the paper can be used as a review of the literature and the practical experiences regarding the lean transformation of hospital processes, and as such it do a service to review editors, opponents, researchers getting acquainted with the topic. Since the structured pieces of information, the contradictions and deficiencies highlighted in the paper make it possible to identify new research areas and questions, the paper provides a good basis for future research.

From the point of view of the use of the concepts of TQM and Lean, the specification of their interrelationship and the finding that there is a significant overlap between the two is also an important result, albeit maybe a less relevant one than the results shown above.

8.2. Practical relevance of the research findings

The systematic overview of the relevant material produced by the research provides a good point of reference to professionals who take part in the planning or execution of lean transformation of hospital processes of any kind, whether in the capacity of manager, employee or consultant. Although the material presented in the dissertation is far from providing a comprehensive overview of the issues and problems encountered in connection with Lean, we have good reason to assume that the issues of the thesis will come up, with emphasis, in every Lean case. Furthermore, the questions raised here may encourage professionals to reconsider and upgrade the practice of Lean.

The clarification of the interrelationship between TQM and Lean will hopefully contribute to the elimination of the parallelisms in the consulting market, which confuse potential customers who are not familiar with this topic.

8.3. Further potential directions of research

During the research, I came across many issues which may be important in connection with the lean transformation of hospital processes and its effectiveness, but have not so far been researched. The issues concerned can be grouped along a few main directions.

The **study of organisational culture in health care** and the propositions concerning its development are not novel things, but they are not given sufficient emphasis in connection with Lean. As shown by the above summary, the crucial issue of the lean transformation of hospital processes is not whether the principles and tools typical of the Toyota Production System can be applied in health care – since we can answer that question with considerable certainty in the affirmative –, but much rather **how the typical culture could be altered so as to create a learning organisation, similar to Toyota, which recognises and accepts and supports the compelling need for continuous change.** As expressed by Spear (2005), health care employs committed and motivated people with very good capabilities, in a concentrated way. The question

is how their commitment to the "vocation" could be put at the service of care and efficiency enhancement. Therefore, it would be desirable to examine the lean processes in the light of organisational development, instead of a simple, technocratic description of the tools. Another question related to this topic, although it already leads us away from the area of production management, may also be important for the success of Lean. This essentially concerns the **exploration of all the factors which lead to the emergence of the typical feudalistic, hierarchical systems, the blaming culture**, so typical of health care. Thus, for example, it is an important question how the doctor training system influences the development of this culture.

A further research direction could be the precise mapping of the **"customers" of the service and of their needs**, the clarification of how the Lean objectives, tools and outcomes will change in function of the choice of the "customer" (e.g. financier or maintainer of the facility instead of the patient) and whether it is possible to reconcile the interests of the various stakeholders.

Similarly, it is recommended to carry out further research in connection with the **application of such tools of lean management as have played no role so far in the hospital cases, albeit it has been demonstrated that they exert a significant influence in the industry,** such as maintenance, supplier contacts (by suppliers I mean here the supplier of material assets as well as the referring family doctors), customer contacts (whoever that customer might be). Indeed, conceivably, the product development experiences could also be thought over, when it comes to the selection of the supply procedures and the materials and tools to be used.

This research also highlights the necessity of systematically planned and implemented research projects to uncover **(i) the possible negative outcomes of lean projects, (ii) the relationship between the identified objectives and the results along the application of the individual tools, (iii) the chronological development, and (iv) the sustainability of the results.**

The other research direction worthy of more attention according to the results of my research is the complexity of the hospital processes and the treatment of further specifics due to that in the context of Lean.

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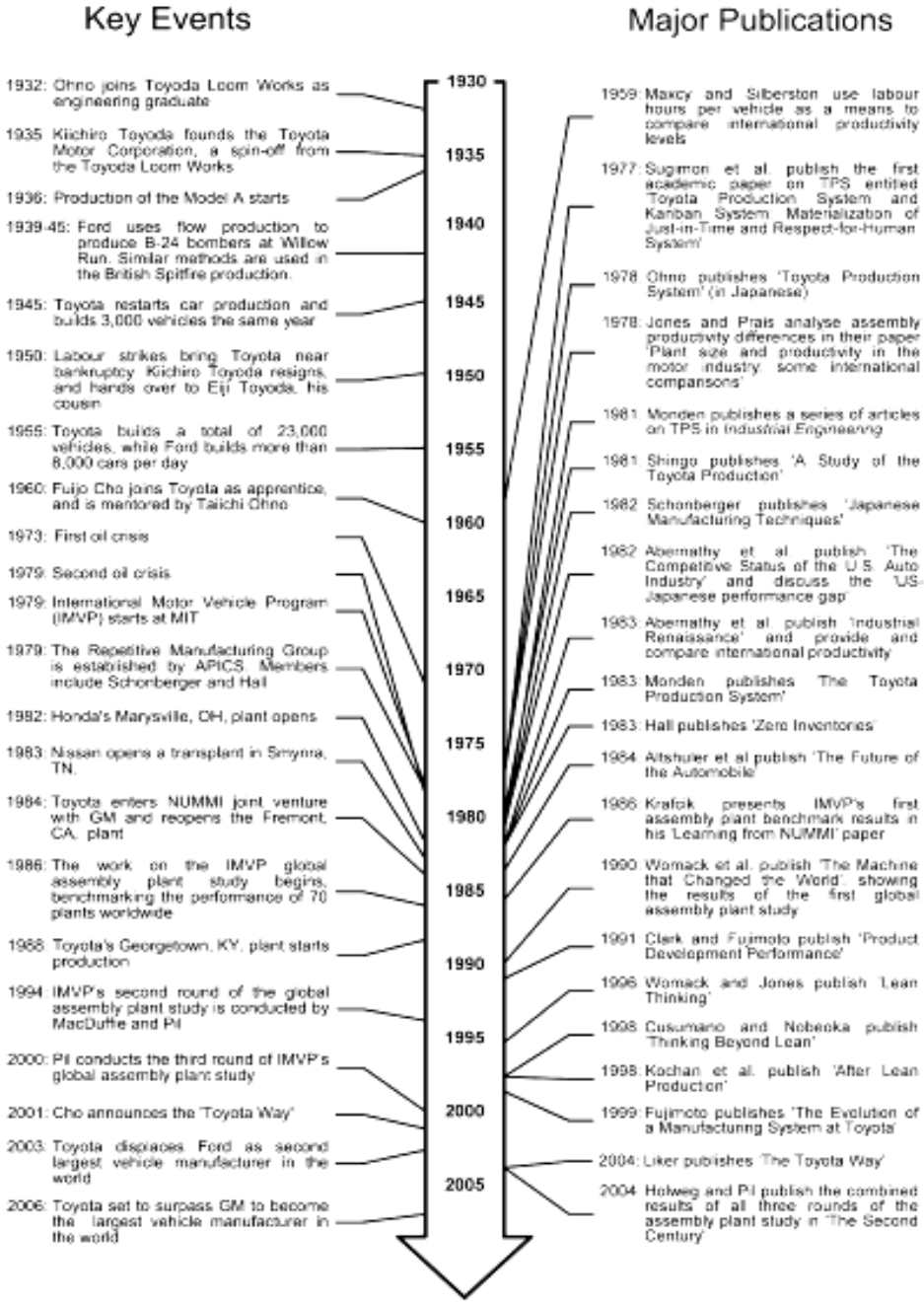
10. Annexes

10.1. Main events and publications related to Lean



Forrás: Holweg, M., 2007, 434. old.

10.2. Lean „practices” according to basic researches

	McLachlin (1997) – The most frequent JIT initiatives	Shah – Ward (2003) – Lean practices in the most important publications	Bhasin – Burcher (2006) – Technical requirements of lean	Shah, R. – Ward, P.T. (2007) – Measures of lean production
Setup time reduction	*	*	*	*
Layout	*			*
Small lots / reducing lot sizes	*	*	*	*
Smoothed production, bottleneck elimination	*	*		*
Pull system/kanban	*	*	*	*
JIT supply	*	*		*
Autonomation (intelligent automation)	*			
Quality/ Total Quality Control	*	*		*
Zero defect	*			
Simple design	*			*
Preventive maintenance	*	*	*	*
Employee involvement	*			*
Flexible workforce	*	*		
Cellular manufacturing		*	*	*
Benchmarking		*		
Continuous improvement		*	*	*
Cycle time reduction		*		
Focused factory		*	*	
Continuous flow		*		*
Optimized maintenance		*		
New machines / technologies		*		
Planning and scheduling strategies		*		
Measuring process capability		*		
Quality management programs		*		*
Reorganized production processes/kaikaku		*	*	
Safety improvements		*		
Independent workgroups		*		
Process mapping			*	
Supplier improvement			*	*
Decreasing supplier base			*	
5S and visual management			*	
Value and seven wastes				
Workforce management				*
Daily schedule				*
Problem solving in groups				*
Training				*
Flexible workgroups				*
Committed workforce				*
Quality level of suppliers				
Customer focus / involvement				*
JIT delivery				*

Forrás: Losonci et al., 2007, 63. old.

10.3. List of own publications on the topic

10.3.1. Foreign-language publications

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10.3.2. Hungarian-language publications

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