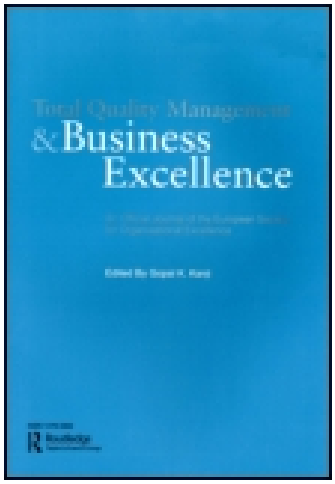

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Quality and lean health care: A system for assessing and improving the health of healthcare organisations

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The purpose of this article is to present and discuss the development of a system for assessing and improving healthcare organisations. The system components comprise (1) a framework or model for assessing, measuring, diagnosing and improving healthcare organisations, (2) a simple methodology for data collection, data analysis and prioritising improvement areas and (3) an index named ILL (innovativeness, learning and lean) for measuring the level of excellence (the 'health level of the organization') and the potentials to increase that level. The system has been based on a simplified excellence model called the '4P Excellence Model' which contains both intangible systemic factors (Leadership, People Management and Partnerships) and more logical tangible factors (Processes and Product/Service Results). The suggested system can be used for assessing the existing organisational culture in relation to ILL and for identifying necessary improvement areas. The suggested system has originally been developed for healthcare organisations, but also been used within other types of organisations such as manufacturing and service companies. This article will only show and discuss the use of the suggested system within healthcare organisations.

Keywords: health care; excellence; KPI; assessment; diagnosing; improvements; prioritisation; innovativeness; learning; lean

Introduction

In recent years, Quality of Health Care has been a much debated issue all over the world. With a steadily aging demography, the pressure on the healthcare sector is increasing and will be subject to hard trials in the years to come. Even if the expenses for health care are rising in many countries medical errors and patient satisfaction seems not to have improved (Spear, 2005). On the contrary, it seems in many cases as if there is a negative correlation between the size of the expenses and the satisfaction of the users and other stakeholders. The reason may be that the expenses are not used efficiently and effectively (Berwick, Nolan, & Whittington, 2008).

When quality indicators, e.g. availability of care, go down there is a tendency everywhere to try solving the problems by letting more money flow into the areas that are poorest on the quality indicators. There is not so much discussion on why the quality indicators are low. The implicit paradigm is that quality costs money, and if you experience low quality you must use more money for improving the quality. Too many politicians seem to have the same simple paradigm, and they seem to have only 'more money' as

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a solution, when problems crop up and the issues are presented and discussed in the media (Spear, 2005; Berwick, Nolan, & Whittington, 2008).

Hence, there is a huge need to discuss quality issues in health care on a much higher level than we have experienced in the past. The healthcare sector has the challenge of reaching the triple aim of providing care, enhancing health and maintaining low cost. Even if health care is specific and cannot be compared directly with other businesses, we are convinced that health care can benefit by studying and adapting the theories, principles and methods of total quality management (TQM), which have proved to be useful in other industries.

The theories, principles, tools and methods of Quality Management can be very useful in the healthcare industry for several reasons. The first reason is that Quality Management has evolved into a holistic and people-oriented management discipline, which requires total employee involvement and teambuilding to succeed. The healthcare industry has had a long tradition of such a culture, so this requirement should not be a problem. Another reason is that modern Quality Management has a lot to offer to health care on the specific principles, tools and methods for working with continuous improvements (Dahlgaard-Park & Dahlgaard, 1999).

In recent years, the term *lean health care* has emerged (Womack & Jones, 1996; Brandao de Souza, 2009), indicating a stronger focus on efficiency and patient satisfaction within the healthcare sector. However, we have experienced that the term has often been misunderstood and hospitals, like many other organisations, start to implement lean production (LP) without having understood the cultural and structural preconditions for implementing LP and TQM (Dahlgaard & Dahlgaard-Park, 2006). Many healthcare organisations have previously tried to implement TQM without great success and had the same experience with LP. It normally requires, as with TQM, a cultural change where the soft or intangible factors of management (the systemic factors) like leadership, people management and partnerships are changed, so that a new organisational culture is developed to support and improve the hospitals core processes.

But to change an existing company culture is not easy. It requires that people understand *what* to change and *why*. If *why* is forgotten, as it often is, then the change may only happen through commands, and this implementation strategy is seldom successful. A better implementation strategy is that people in the first implementation step are involved in an efficient and effective self-assessment process where critical success factors and performance indicators are assessed and discussed in relation to the overall goal of developing a lean healthcare culture. Unfortunately, it seems that existing assessment methodologies based on existing excellence models like the European (EFQM) Excellence Model has been used mainly to support experts when writing an award application. Such a methodology is good if the organisation *has become* excellent and can be called a lean healthcare organisation (cf. Ruiz & Simon, 2004). However, to start the journey to excellence there is a need for another assessment methodology, a simple methodology and assessment framework or model, which invites all employees to participate. At the moment, there is a great need for developing such an assessment and improvement methodology.

The purpose of this article is to present and discuss the development of a system for assessing and improving healthcare organisations. The system components comprise:

(1) A framework or model for assessing, measuring, diagnosing and improving healthcare organisations.
(2) A simple methodology for data collection, data analysis and prioritising improvement areas.

(3) An index named ILL (innovativeness, learning and lean) for measuring the level of excellence (the 'health level of the organization') and the potentials to increase that level.

The first two components have been developed and tested during a period of 10–15 years in several healthcare, as well as other, organisations. The last component has recently been developed to satisfy a need of all type of organisations, which first became obvious for us during discussions on healthcare measurements with partners of a 'Lean Health Care project' with five universities and five hospitals as partners, run in 2009–2010 supported by EU Leonardo funding. With this last development, we dare to call the three components *A System for Assessing and Improving Healthcare Organisations.*

In the article, we will first discuss some of the current challenges and problems in the healthcare sector and discuss how the principles of Quality Management and LP can be incorporated into a healthcare setting and provide a basis for development of a *lean healthcare organisation*. After that the core of the article will focus on how to assess and diagnose healthcare organisations by using a framework or model for assessment together with a simple methodology for data collection, data analysis and improvements, which have been used in a Danish Hospital. At the end of the article, a new measure to understand organisations' level of ILL and its improvement potentials will be demonstrated by using data from the Danish hospital case.

Current problems and challenges in health care

To write generally about the quality situation in health care is always risky because there may be great variation between and within countries, hospitals as well as comparable clinics. This section can therefore only present a few limited examples and facts, which may or may not be a fair representation of the quality level in health care, but nevertheless illustrates that there is a lot of waste in healthcare organisations like in any other organisation. One main aim of LP is to identify and reduce waste everywhere in the organisation, where waste is defined as *any human activity which absorbs resources but creates no value* (Womack & Jones, 2003, p. 15).

Errors in administration of injected medication

The administration of medicine is one major problem in the healthcare sector. In a large study in the UK, Valentin et al. (2009) found that one-third of the patients ($n = 1328$) were affected by various errors. The most frequent errors were related to the wrong time of administration and missing doses altogether. Cases of incorrect doses and wrong drugs being given were also reported. A total of 69% of the errors occurred during routine care. Mistakes occurred with many types of drugs, including insulin for diabetics, sedatives and blood-clotting drugs. Of the 441 patients affected, 7 suffered permanent harm and 5 died partly because of the error. Nearly half of the affected patients suffered more than one mistake during the period covered. The problems identified applied to almost all the healthcare units involved in the study because just only one in five units reported no adverse events during the 24-h period studied.

When trying to understand why so many errors had happened during the period of analysis medical staff was interviewed, and the doctors and nurses who took part in the study cited stress and tiredness as a contributing factor in a third of the mistakes. Other contributing factors mentioned were recent changes in the drug's name, poor communication between staff and violation of protocols. An important reflection was that the

odds of an error being made increased significantly for the most severely ill patients. In such situations, the care situation is very complex and stress is likely to be a root cause behind the errors. An obvious conclusion from the study was that the administration of injected medication is a weak point in patient safety and hence is a root cause of much waste in the form of time, pain and life.

Infections

Today, we know that patients may suffer from infections during and after treatment at a hospital. A main root cause may be poor hygiene because employees are not always very careful about washing their hands when it is really needed. That was one of the root causes identified by the birth physician Ignaz Philipp in Vienna back in 1850. Ignaz Philipp experienced that 20% of the women died at the hospitals within a few days after delivery. He experienced an even higher death rate with women who had planned to deliver at home but came to the hospital because of a complex delivery 25% of those women died. When Ignaz Philipp understood that the root cause might be poor hygiene because the employees had no tradition of washing their hands, he suggested a strict hand-washing procedure to be implemented at the birth department, and the effects could be seen immediately. Death rates decreased to 1–2%.

That is history, but is poor hygiene a hospital problem of today? Unfortunately and surprisingly, poor hygiene seems to be still a major problem at our hospitals (Erasmus et al., 2009). Erasmus et al. (2009) found that hand hygiene is mostly done for the sake of personal protection, in conjunction with tasks that are perceived to be dirty. According to this study, hand hygiene is deemed more important for compliance than for the sake of patient safety. In a similar study, Zimakoff (1993) found that hand washing at intensive departments was done less than half of the times where procedures required such a preventive activity. Other similar studies in Denmark and abroad have confirmed these results. The employees know very well the hygiene standard procedures but they do not practise the procedures very well when they are busy. It is obvious that hospitals may have exactly the same motivational problems as industrial companies may have when quality assurance systems are being implemented.

In Denmark, it has been estimated (Zimakoff, 1999) that every hour year around, 10 patients will be infected at the hospitals. On a yearly basis 87,600 patients will get an infection. If we can ignore the patients' sufferings the effect at the Danish surgery departments has been estimated as prolonged stay at the hospitals equal to 300,000 bed-days per year. The effect on waiting lists is obvious. Further to that the cost was estimated to Danish Kroner 700 million, which is equal to the yearly cost to run a hospital with 822 beds. This is really a waste of resources which we interpret as a major hospital problem!

Lean health care

Definition

There has been much debate about the differences and similarities between various management concepts over the years (Andersson, Eriksson, & Torstensson, 2006; Dahlgaard & Dahlgaard-Park, 2006; Hackman & Wageman, 1995). When it comes to LP, the concept is not consistently defined in literature, but can be said to consist of five general practices: (1) just in time, (2) resource reduction, (3) improvement strategies, (4) standardisation and (5) scientific management (Pettersen, 2009).

The management discourse has not only made an impact in the manufacturing industry. The healthcare industry has also seen various management concepts come and

go over the years (Ruiz & Simon, 2004). In recent years, the discussions have been centred on the potential application of lean principles in health care (Kollberg, Dahlgaard, & Brehmer, 2007). The term *lean health care* has emerged as a result of this discussion, and has become the benchmark of modern healthcare management (Brandao de Souza, 2009).

Our definition of *lean health care* is the following:

> *Lean health care* is a management philosophy to develop a hospital culture characterised by increased patient and other stakeholder satisfaction through continuous improvements, in which all employees (managers, physicians, nurses, laboratory people, technicians, office people etc.) actively participate in identifying and reducing non-value-adding activities (waste).

By defining the aim of lean health care to create a corporate *culture* characterised by continuous improvements and everybody's participation it is easy to understand that it takes time to establish a lean healthcare organisation. The organisations (hospital, departments, groups and individuals) must first understand their current culture and the drawbacks of such a culture, and then they must agree to change their culture into a quite new culture state (Hildebrandt, Kristensen, Kanji, & Dahlgaard, 1991). That is not easy, because people involved often have to change their old paradigms.

The biggest potential for improvements is between sub-processes, functions and department. People may accept poor quality, because it is not their responsibility if things go wrong, and the company management or department management try to use 'fire fighting', when 'things go too much wrong'. They do not understand that the root cause for problems and waste is related to lack of ownership/responsibility for the cross-functional processes. The primary customers – the patients – suffer because of this situation, and the hospital suffers because of too much waste. This does not only apply at the operative level in the organisation, but also at a managerial level. Managers seem to take the responsibility/challenge of improving the organisation too lightly, even if improving the system is the management's job.

Improving complex systems like healthcare organisations is not a small challenge. However, the methodology, framework and measurements suggested in this article may be useful guides towards creating a lean healthcare organisation.

Making the lean transition in healthcare settings

Organisational change and company culture are a bit of the chicken-and-egg paradox. A supporting culture is required for changes to be successful, but successful changes are what reinforce the fundamental values on which the culture is based (Hildebrandt, Kristensen, Kanji, & Dahlgaard, 1991). It is therefore important to achieve results quickly, in order to motivate the people and stimulate cooperation (Åhlström, 1998).

It is important for organisations to realise that lean health care is a loosely defined and ambiguous concept. Therefore, managers should be able to adapt the concept to the specific conditions of their organisation. Following Benders and Slomp (2009), an organisation needs to address three questions regarding the implementation of lean:

(1) What concrete purpose is lean health care going to serve?
(2) How is this going to be worked out in an organisation-wide change program?
(3) How can this program be applied in intra-organisational change projects?

The tools and techniques that are applied in the organisation need to be related to the overall strategy and the principles of lean health care in order to be successful. This argument is also maintained by Kollberg and Elg (2006). In addition, they suggest that

a dialogue between the stakeholders within the organisation should be an initial part of the change project.

Kollberg and Elg (2006) present four major challenges that need to be addressed when implementing changes in a healthcare organisation. First, since health care is usually a public service, there is a need to strive for national consensus regarding the changes, although they are to be implemented in a local context. Second, creating a well-functioning project group and maintaining the competence within the group require careful planning and consideration. Third, organisational change requires in depth scrutiny of the organisation, which in many cases can be uncomfortable. Getting the managers to accept this and encourage them to support the change project can be a substantial challenge. Fourth, identifying end users of the new systems can be very difficult. Understanding their needs and taking them into account in the change process is of vital importance.

A sustainable strategy for building lean and excellence

There are great risks in attempting to revolutionise an organisation without having a stable company culture on which to build. In other words, the fundamental principles of TQM must be in place for any organisational change effort to be successful (Dahlgaard & Dahlgaard-Park, 2006).

The '4P' model, as illustrated in Figure 1, provides a recommended structure or sustainable strategy for achieving innovation excellence (Dahlgaard-Park & Dahlgaard, 1999; Dahlgaard & Dahlgaard-Park, 2008). According to the model, building quality or excellence into the following '4P' is a precondition for 'Organizational Excellence' (OE): (1) people, (2) partnership/teams, (3) processes of work and (4) products/service products.

'The 4P' model is suggested based on the recent awareness on human resources and their role in the organisational context as the basic unit for any organisational improvement activity. From this viewpoint, it is argued that the first priority of any quality or excellence strategy should be to build quality into people as the essential foundation and catalyst for improving partnerships, processes and products. But what does that really mean? In order to answer that question we need to understand human nature, human needs, human psychology, environmental and contextual factors of human behaviour because the project of 'building quality into people' can only be carried out when we have a profound knowledge of people and psychology (Deming, 1993).

The quality strategy should be implemented multidirectionally, i.e. through a top-down, middle-up-down and a bottom-up strategy (Dahlgaard, Kristensen, & Kanji, 1998, 2002). The strategy should follow the Policy Deployment approach (Hoshin

Figure 1. Building OE through leadership and 'the 4P'.

Kanri), which has both the top-down and the bottom-up strategy included. Such an approach provides a framework for building quality into the following three levels (Dahlgaard-Park & Dahlgaard, 1998, 2008):

(1) individual level,
(2) team level and
(3) organisational level.

An efficient quality strategy aiming at improving 'the 4P' can only be developed based on an understanding of the interrelationships and interactions between individuals, teams and the organisation and the critical contextual factors at each level. Figure 1 illustrates these interrelationships and the process of building these different levels.

The figure indicates that building OE starts with *building Leadership*, which means developing (educating/training) and/or recruiting leaders with the right values and competencies.

The next step is to develop and/or recruit *People* with the right values and competencies. Especially on the value dimension leaders' behaviours determine if core values (as for example trust, respect, openness etc.) will be diffused and will become a part of the organisational culture (Dahlgaard-Park & Dahlgaard, 1999).

Building Partnership/Teams means that teams are established and developed, so that each team is able to practice the right and needed values and competencies, and *Partnership* is established in all people relationships – within the team, between team members (intra-team), between teams (inter-team) and with other people or groups outside the team (suppliers, lead customers etc.).

Building Processes means that leaders, individuals and teams day-by-day try to practice the needed values and competencies based on the principle of continuous improvement and the company's mission, vision, goals and strategies.

Building Products/Services means building quality into tangible and intangible products/services through a constant focus on customers' needs and market potentials, and to practice the principles of continuous improvement parallel with innovativeness in new product development.

The foundation (building leadership) supports the four other factors represented by 'the 4P' and all together the five factors comprise a roadmap to the 'result' called OE. It is assumed by the model, that all five factors are necessary for achieving OE. A prerequisite for using the '4P roadmap' is *Excellent Leadership*.

In Park-Dahlgaard (2007), the '4P Model' in Figure 1 has been compared with a '4P model' used for explaining the 14 principles of the Toyota Production System (Liker, 2004) and hence for building a lean organisation. The two different models developed independently of each other have surprising similarities. The main difference between the two models is, on the surface, that the foundation in Liker's '4P model' in stead of *Leadership* is called *Long-Term Philosophy* (= base management decisions on a long-term philosophy, even at the expense of short-term financial goals). Another difference is that in Liker's model 'Processes' is the second layer and 'People' the fourth layer. For more details about building excellent leadership (see Dahlgaard, Kristensen, & Kanji, 1998, 2002; Dahlgaard-Park & Dahlgaard, 2008).

Assessing and diagnosing healthcare organisations

In the previous sections, we have tried to make it clear that quality improvements and waste reduction in hospitals (and any other organisation) require a holistic and profound

understanding about the problems (known or unknown) which are a result of the way people work and organise themselves. It should also have become clear for the readers, that quality improvements and waste reduction require a systematic and well-planned process, where all employees are involved in identifying:

(1) the problems,
(2) the root causes behind the problems and
(3) the needed actions for eliminating the problems.

As waste is everywhere in any organisation so are problems. Elimination of waste starts with the identification of the problems which are experienced by patients and employees. An indicator for many problems in a department or a process is poor results e.g. long waiting time for new patients, high sickness rate, low productivity etc. To find the root cause(s) behind a problem is not always easy, because:

(1) Some of the causes belong to the system (the management system or the 'production system') i.e. the causes are built into the system and so affect the processes permanently.
(2) Some of the causes are specific, which are related to a specific person or another specific cause factor, which does not have a permanent effect (Deming, 1993).

There is definitely a need to use a holistic model, which can help managers and employees to identify the cause–effect relationships from the problems to results and to enablers of different types. In the following two sections, we will first present the European (EFQM) Excellence Model as one example of such a model, and then we will present, in the following section, our suggested model or framework for assessing and diagnosing healthcare organisations.

Using the '4P excellence model' for diagnosing ILL – a framework for assessing and diagnosing health care

Based on several experiences from Sweden, many healthcare organisations have experienced that using original excellence models like the European (EFQM) Excellence Model or the American Malcolm Baldridge Excellence Model for self-assessment is too time-consuming. As a result of this, most hospitals prefer to use simpler models or frameworks such as the Balanced Scorecard. At the same time, more and more organisations have had good experience in simplifying the original Excellence Models to fit the real purpose – not to apply for an excellence award but to improve their business.

One example is the Danish company Grundfos (Dahlgaard-Park & Dahlgaard, 2008; Dahlgaard-Park, 2009) which, after having assessed the excellence level of Innovation and New Product Development, could simplify the European (EFQM) Excellence Model with the '4P' Excellence Model. Figure 2 shows this '4P Excellence Model' adapted for assessing and diagnosing ILL of healthcare organisations.

For using the above model we need, as with the European Excellence Model, a number of potential areas to address which can be selected and measured as 'key performance indicators' (KPIs). Based on the theoretical discussions and references in this article together with experiences of assessing and diagnosing excellence in several organisations including a Danish hospital case, the 50 statements shown in the Appendix 1 are suggested as potential areas to address when assessing the performance of healthcare organisations. Each statement is formulated as a positive statement, and the assumption is that if an organisation can say 'yes, we do that' to an enabler statement then it indicates that

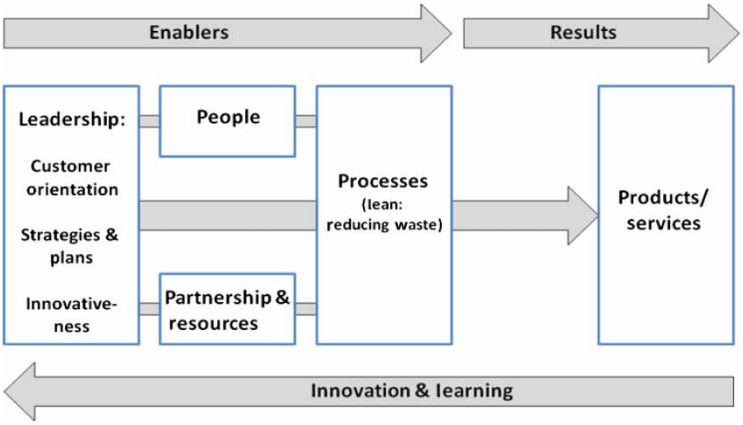

Figure 2. The '4P' model for diagnosing ILL.

activities has been implemented, which supports ILL. If an organisation can say 'yes, we achieved that' to a result statement then it indicates that the practiced enablers have produced the specific result. In the specific case, the healthcare unit may want to reduce the number of statements to maybe 30 statements, and maybe it will also be needed to supplement the list with new areas (KPI) to address.

One fundamental idea in using the model is, that at the beginning of a plan for improvement cycle the co-called right-left approach is used to assess the results achieved. The idea of this approach is that you try to learn from the results by going left in the model from the result you try to understand to the enablers, identifying the potential cause–effect relationships between 'enabler KPIs' and the selected result. By doing so you are developing the so-called diagnostic path, which is useful for the subsequent planning for better results. In the planning for better results you may use the 'left-right approach', where you decide how you will improve your enablers specified by the identified KPIs to get better results in the next period (Conti, 1997).

In the following sections of this paper, we will show how a Danish hospital unit has used a selection of the framework for data collection, data analysis and diagnosing based on self-assessments where all employees were invited to participate.

A Danish case

The European Excellence Model was used in a research project started up in a Danish hospital in 1999. The Danish hospital is one of the leading Danish hospitals seen from a quality point of view, because the hospital received the 'Runner Up Prize' when applying for the Danish Quality Award for Public Institutions in 1998. The aim of the research project was to design and test a questionnaire to be used for self-assessment at one of the hospital departments. The research team wanted to construct a practical and easy tool, which could be used to:

(1) involve all employees in a department,
(2) identify important relationships between enablers and results and
(3) identify the most urgent problem areas which should be improved first.

The questionnaire was designed in co-operation with the hospital, and the questions were inspired by the potential 'areas to address', which are related to the different criteria

and sub-criteria in EFQM's self-assessment brochure material. In the process of designing the questions, which were formulated as statements, the project group was very attentive to the verbal formulation. For each statement, the project group tested that the verbal formulation was in accordance with the words used in the department chosen - department of Genecology and Obstetrics.

The final questionnaire consisted of 97 statements in total, approximately 10 statements under each criterion. For each statement the clinical staff (physicians, nurses, etc.) was invited to evaluate their level of agreement and also how important they evaluated the statement to be for their daily work. An example of a statement under Leadership was the following: 'Management always expresses their recognition when employees have made a good effort.'

Respondents were asked to rank each statement according to their perceived degrees of *agreement* and *importance* using a Liker scale ranging from 1 to 7. On the 'importance' scale, a '1' indicates that the statement according to him/her is of very minor importance, while statements that score '7' are perceived as having very high importance. On the agreement scale, a '1' indicates that the respondent fully disagrees with the statement, while a score of '7' means that the respondent fully agrees with it.

To fully disagree with a statement means for the enabler statements that the respondent does not agree that the driver (activity) behind the statement has been implemented into daily practice. This means, for example, that the respondent never experienced recognition from the management. To fully agree with a statement means, for the enabler statements that the respondent totally agrees that the driver (activity) behind the statement has been implemented into daily practice. With the same example as above it means that the respondent always experiences recognition from the management when he or she has made good efforts.

Generally the importance measurements (I) can be understood as indications of the respondents' needs and the agreement measurements (P) as indications of the organisation's performance. Any negative difference between perceived indicated performance and perceived importance (P–I) can be regarded as a gap indicating an opportunity for improvement seen from the respondents' points of view.

The idea of asking the respondents both about agreement and importance is that by doing so, it is possible to rank the potential areas for improvements after importance. The most important areas are related to the statements where the difference ('gap') between importance and agreement is highest. The theory behind this type of questionnaire is that the optimal situation is characterised by having equality between importance and agreement (see Eskildsen & Dahlgaard, 1998; Dahlgaard & Eskildsen, 1999). The assumption behind this simple rule is that the marginal costs to reduce the gaps with one unit are the same for all statement areas. Of course this assumption is a simplification because some areas may be easier to improve than other areas. Hence this assumption should be questioned when prioritising which areas should be improved first.

If you can accept the simplified assumption you can use the simplified rule. That means if importance is significantly higher than agreement you should improve the area, and if you are in the opposite situation – agreement is higher than importance – you may choose to use fewer resources or to have less focus on that area. However, a cause for having agreement measurements higher than importance may be that respondents do not understand the importance of the statement (why the statement is important). In this case, it is important that management discuss with the employees about the reasons why respondents may have under-estimated the importance.

The results of the data analysis may be shown in so-called *quality maps*. Figure 3 shows such a quality map where the leadership KPI measurements are shown. The

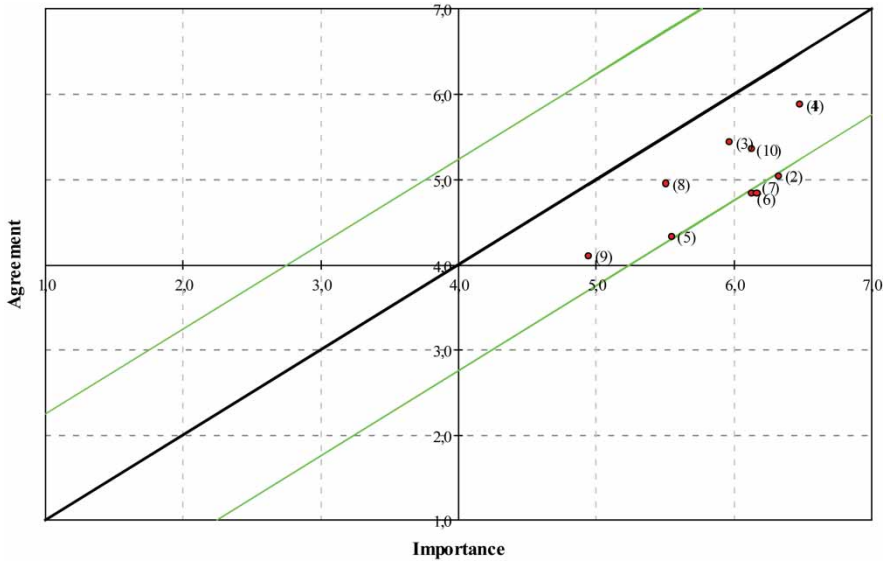

Figure 3. The leadership quality map.

quality map shows, for each statement in the questionnaire, the average measurements on importance and agreement together with the so-called control limits, which can help in deciding if a gap is the result of random causes only (the natural variation for example caused by the measurement method used). If the variation is the result of random causes only, the measurements will vary randomly within the control limits. Measurements outside the control limits are the significant measurements. Such control limits can be calculated by using the theory of 'paired observations' where each 'pair' is the respondents' assessment of each statement (KPI) in the questionnaire.

From the diagram in Figure 3 *the biggest leadership gaps* were identified to be the following:

(1) Management always expresses their recognition when employees have made a good effort (Statement 7).
(2) Management makes great efforts to improve communication in the company (Statement 6).
(3) Management regularly evaluates the employees' involvement in quality improvements (Statement 2).
(4) Management grants sufficient resources for employee education and training (Statement 5).

The biggest gaps in the other criterions of the European Excellence Model can be seen in Appendix 2.

As the statements have been expressed positively, we can conclude that the above statements are not true. Hence management must, together with the clinical staff, try to understand why these leadership statements are not true. Management must understand why the respondents have these experiences and discuss if they can practice good leadership when people have such kind of experiences.

The problem areas and the causes behind, which can be identified by this kind of analysis, are mostly the important system problems and causes. Those problems and

causes are very important to understand and to remove, because left to themselves it will be very difficult to have success with the other types of improvement activities, which have been discussed in this article. In this relation it is important to remember, that system causes usually are 'responsible' for 80–90% of all problems (Deming, 1993).

For a more detailed data analysis and diagnosis see Dahlgaard-Park and Dahlgaard (1999) and Appendix 2. From the detailed data analysis, it followed that the biggest gaps on the enablers were related to (1) people, (2) partnerships & resources and (3) processes. On the results side the biggest gaps were related to (1) people result, and (2) patient results.

But what do such gaps mean in relation to the last purpose of this article – *measuring the potential to increase the level of Excellence*? Is it possible to use the measurement data like a doctor or nurse when measuring if a patient is ill? We will show how to construct such a measurement instrument in the following section.

Measuring the level of ILL

There are several ways to measure the level of ILL. In this section, we will discuss one alternative and illustrate this alternative with data collected on Leadership from the Danish hospital case. We will use the four biggest gaps from the leadership criterion as shown in Table 1. In a real case all measurements under the various criteria of the excellence model shall be used for measuring the ILL level of each criterion and the total ILL level.

The suggested ILL index uses the ratio of average agreement and average importance. The simple logic behind this measure is that if we are in the optimal case then the ILL index is equal to 1.0, because all average points are on the diagonal. In this case we see that the ILL index is equal to 0.81, which means that the hospital should look for improvements within these statements so that the index gradually improves with 19% points.

The suggested ratio may be misleading if average agreement is higher than average importance for one or more statements. In this case, we recommend not including the statements in the calculation of the index. Usually, the reason for such measurements is that the respondents have not understood the importance dimension related to the statement area.

An ILL index for all criteria can also be calculated. The most simple is to calculate the average of each criterion's ILL index (Dahlgaard-Park & Dahlgaard, 2010). In this case

Table 1. An example of measuring the ILL level (Danish Hospital Case).

Leadership statements (KPI)		Importance	Agreement
1.	Management always expresses their recognition when employees have made a good effort	6.15	4.75
2	Management makes great efforts to improve communication in the company	6.10	4.75
3	Management regularly evaluates the employees' involvement in quality improvements	6.30	4.95
4	Management grants sufficient resources for employee education and training	5.55	5.20
	Averages	6.03	
	ILL level (index)	4.91/6.03 = 0.81	

the assumption is that all criteria have the same importance and so they should also have equal weight when calculating the total ILL index.

If the assumption of equal weights is rejected, then it will be necessary to decide on which weights to be used before the ILL index can be calculated. One possibility, which may be argued for, is that the systemic factors of the model (Leadership, People Management and Partnership & Resources) share a weight of 1/3 (= 33.3%), Processes get a weight of 1/3 and Results get a weight of 1/3.

The ILL index may be used as an overall ratio, which can be compared from period to period to show if the organisation has improved and hence has become 'sounder' on ILL. We regard the ILL index as a measurement showing how excellent the organisation is or how ILL it is. The lower the ILL index the more ILL is the organisation.

Conclusions

The purpose of this article was to present and discuss the development of a system for assessing and improving healthcare organisations. This purpose was achieved by developing and suggesting the following components:

(1) The '4P Excellence Model' for diagnosing ILL,
(2) The Focused Self-Assessment methodology presented and discussed in the section on the Danish Healthcare case and
(3) A measure for understanding the level of ILL and the improvement potential.

These three components should be understood as an integrated system where each component depends on the other two components.

The first component, the '4P Excellence Model', shows the key enablers or the success criteria for becoming excellent in ILL. Based on a combination of theoretical research and empirical experiences, we have supplemented the model with a framework for identifying and measuring potential KPIs under each criterion of the suggested model. The KPIs were formulated as positive statements.

The second component, the Focused Self-Assessment methodology, shows how data can be collected by using a questionnaire approach. By using this approach, it is possible to invite all employees to participate in the self-assessment. In the questionnaire survey people are asked to assess each statement in two dimensions, importance and agreement, on the same Liker scale. Gaps are identified if there are significant differences between the two measurements, and the simple rule tells us to improve the biggest gaps first.

The third component uses the two measurements (importance and agreement) when constructing an index to understand the organisation's ILL level. A low index means that the organisation is ILL and hence far from excellence and a high index means that the organisation is sound and capable of delivering efficient and effective healthcare services. As the index always is a measure between 0 and 1.0, the potential for overall improvements is measured as 1.0 minus the index measurement.

As the suggested '4P Excellence Model' contains both intangible systemic factors (Leadership, People Management, Partnerships) and more logical tangible factors (Processes and Product/Service Results) the suggested system can be used for assessing the existing organisational culture in relation to ILL and for identifying necessary improvement areas. It is our hope that the suggested system will be used intensively within healthcare organisations all over the world. We need such kinds of simple systems to be tested intensively within health care.

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Appendix 1: Potential assessment statements (KPI)

Leadership

1. Managers are role models and good teachers of the hospital's philosophy and way of practicing lean principles.
2. Management always expresses their recognition when employees have made a good effort.
3. Management makes great efforts to improve communication in the company.
4. Management regularly evaluates employees' involvement in waste reduction projects.
5. Management grants sufficient resources for employee's education and training.
6. When determining objectives and strategies management involves the employees.
7. The hospital's innovation culture is based on a continuous focus on patients' needs.
8. The organisation is characterised by an innovative culture where employees have time to think freely and follow up on own ideas, learn of experiences, etc.
9. Visions, goals and strategies for innovations are developed.
10. Visions, goals and strategies for innovations are communicated clearly to everybody.

People management

1. The organisation makes an ongoing effort to train individuals how to work together as teams toward common goals.
2. The organisation continuously evaluates the efforts made by employees in relation to the jointly established objectives.
3. The organisation establishes, in co-operation with the employees, objectives for the following period.
4. The organisation continuously evaluates the skills and attitudes of the employees.
5. The organisation composes in co-operation with each employee an education plan.
6. The organisation listen to the employees and follow-up on their comments.
7. Management continuously encourages employees to make proposals for the improvement of their daily work/routines.
8. Feed-back is given to the individual as well as to the team concerning improvement suggestions for innovation.
9. Employees who contribute actively to process or result objectives within the innovation area are in some way promoted, empowered, recognised or rewarded.
10. Employees are empowered to make decisions about their innovation projects and participate in the planning and decision making for innovation.

Partnerships and resources

1. Cross-functional teams are used to improve quality and productivity and enhance flow by solving difficult technical and other problems.
2. The organization identifies strategic partners for improvement of innovation processes.
3. We show respect for our external partners and suppliers and treat them as an extension of our organization.
4. We have agreements and yearly goals for external customer-supplier relationships.
5. The resources necessary for the company's innovation programs are clearly mapped out.
6. The hospital has objectives and standards for how it-resources are to be managed.
7. The department has written objectives and standards for how tangible resources are to be managed.

8. Information on errors and problems are systematically used for improvements of the exploitation of resources.
9. The department systematically plans for maintenance of machinery and other equipment.
10. The department regularly measures waste of materials and other resources.

Processes

1. The organisation is continuously striving to reduce waiting time for patients or projects.
2. Organisational learning is ensured through standardising today's best practices.
3. People contribute with creative and individual suggestions to improve standards.
4. Visual systems to support flow and pull are in place at the place where the work is done.
5. Thoroughly considered technologies are quickly implemented if they can improve flow in processes.
6. Problems are solved by going to the source and personally observing and verifying data.
7. Continuous improvement tools are used to determine the root cause of inefficiencies.
8. Employees are trained to use a formal/standardised improvement process.
9. Improvement/innovation groups have a constant focus on patients' problems/needs.
10. Process measurements have been established for all important processes.

Products/services results

1. Patients' satisfaction has been improved during the last 3 years.
2. Clinical outcomes have been improved during the last 3 years (Wellness, malpractice, infections, adverse events, morbidity, mortality rates, etc.).
3. Efficiency indicators have been improved during the last 3 years (Bed Occupancy Rate, bed turnover rate, etc.).
4. Effectiveness indicators have been improved during the last 3 years (mortality and morbidity rates, etc.).
5. The organisation has a strong culture in which the hospital's values and beliefs are widely shared and lived out.
6. Trust and respect between people have increased during the last 3 years.
7. Employees are committed to the goals of their improvement/innovation projects.
8. The employees' motivation and commitment have increased during the last 3 years.
9. Innovation/improvement programs' impact on overall performance has increased during the last 3 years.
10. The hospital's overall image has improved during the last 3 years.

Appendix 2: Biggest gaps – Danish hospital case

Leadership:

1. Management always expresses their recognition when employees have made a good effort.
2. Management makes great efforts to improve communication in the company.
3. Management regularly evaluates the employees' involvement in quality improvements.
4. Management grants sufficient resources for employee education and training.

Policy and strategy:

1. On the basis of overall objectives and strategies established, management and employees decide on objectives and strategies in each department.
2. The department continuously reviews its objectives and strategies.
3. The departments' objectives and strategies are based on knowledge about the competencies of the employees.
4. When determining objectives and strategies management involves the employees.

People management:

1. The department continuously evaluates the efforts made by employees in relation to the jointly established objectives.

2. The department establishes, in co-operation with the employees, objectives for the following period.
3. The department continuously evaluates the skills of the employees.
4. The department composes, in co-operation with each employee, an education plan.
5. The department listens to the employees and follow-up on their comments.
6. The department management continuously encourages employees to make proposals for the improvement of their daily work/routines.

Resources:

1. The hospital has written objectives and standards for how IT-resources are to be managed.
2. The department allows the employees to apply the latest and most appropriate technology.
3. The department regularly measures waste of materials.
4. The department has written objectives and standards for how tangible resources are to be managed.
5. Information on errors and problems are systematically used for improvements of the exploitation of resources everywhere in the department.
6. The department systematically plans for maintenance of the machinery.

Processes:

1. Process measurements have been established for all important processes.
2. The department always budgets for costs and benefits associated with initiated process changes.
3. Whenever process changes are made all employees involved receive adequate training.
4. Whenever suggestions for process changes are made everybody affected is involved.
5. When evaluating key processes information on best external practice is included.

People satisfaction:

1. The department improves the working conditions based on the results of people satisfaction analyses.
2. Future goals for people satisfaction are known by every employee.
3. People satisfaction has increased significantly during the last 3 years.
4. Illness and absence among the employees have decreased significantly during the last 3 years.
5. Employee turnover has decreased significantly during the last 3 years.

Patient satisfaction:

1. Future goals for patient satisfaction are known by every employee in the department.
2. The department compares the level of patient satisfaction between different patient groups.
3. The department compares the level of patient satisfaction with other departments.
4. At least once a year the department compares the level of patient satisfaction with other hospitals
5. The number of complaints has decreased significantly during the last 3 years.