

Proposal of a Master Plan for “the Hospital of the Future” by Means of a Modulation of the  
“Health Care Product”

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ABSTRACT:

This paper cross-fertilises the experiences and knowledge from the health care sector with mechanical industries, thus creating on one hand synergetic effects and on the other hand crystallising important future areas of research and development work.

The theoretical and practical frames of reference utilised are fetched from the authors' professional work as responsible for industrial product development activities, research and development of production system designs, and an architect of health care building facilities.

The article comprises (1) sketching a background which recapitulates some general recognised facts regarding health care service in Sweden, particularly in the county of Dalarna. Thereafter (2) some practical and theoretical frames of reference are explained in accordance with the authors' earlier publications within the problem area of health care service and hospital designs. Thereafter (3) the meaning of the “health care product” is elaborated by means of defining two matrixes. One matrix is composed of the treatment-oriented and care-oriented organisations compared with the care and the treatment-oriented “health care product”. The other matrix is composed of treatment-oriented and care-oriented employees compared with treatment-oriented and care-oriented patients. These matrixes are a way of modulating the discourse regarding the meaning of “the health care product” and its interconnection to hospital designs.

## 1 Background

In order to roughly sketch the background of the problem areas and insights touched upon in this paper the following question summarises the present state of the art concerning various aspects of hospital designs and health care service: “How may we practically meet this demand and change our overarching structure for health care service, including design of hospital designs in the future?” This question pinpoints the multifaceted dilemma of the health care sector in Sweden today, which is derived from a number of preconditions.

Firstly, the health care service provided to Swedish citizens has traditionally been regarded as a public responsibility financed by governmental taxes. Thus, in Sweden there exists a long tradition of organising the health care service in a context of the whole society. Even though the country in the last decade has witnessed a trend towards private alternatives, the public sector is – and will continue to be in the future – the main actor responsible for providing this service.

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Secondly, contemplating a map of Sweden, for instance from the beginning of the 1990s, we discover that there existed about seventy general hospitals and seven university hospitals. In this specific period of time it was already obvious that a restructuring process was inevitable, owing to facts like uneven and successively changing population density, various medical advantages, etc., which consequently implied a strained economic situation for many small-scale operations.

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Using the county of Dalarna as an example of this multifaceted dilemma. The county's history illuminates the restructuring process:

Until around 1995 the county included four organisational independent general hospitals. One of those, Falun central hospital, was larger and provided service to the other hospitals regarding medical specialities. The three other general hospitals were designed to serve a population of approximately 40 000 – 50 000 inhabitants comprising separate clinics for medicine, surgery and obstetrics. They also included intensive care emergency units available both day and night.

Since all physicians were employed by the hospitals a great number of outpatient departments were at hand at each hospital, which has traditionally been the case in Sweden. However, the four general hospitals were directly inflicted by changed preconditions in the form of e.g. reduced financial resources. The patients were allowed to stay on the hospital premises for increasingly shorter periods of time and this in consequence led to a substantial reduction of the number of in-patient beds. A restructuring process thereby became an inevitable fact.

This new situation first became evident at the three smaller general hospitals which experienced difficulties in recruiting appropriate personnel with up-to-date knowledge, and it was especially hard to recruit physicians with the right kind of experience. Due to this competence shortage sections of the hospitals had to be closed down and the patients were directed to other hospitals, mainly to the central hospital in Falun.

Thus it may fairly be stated that the inhabitants in Dalarna gradually perceived a "loss of security" when they successively lost their close access to health care service. This led to a general loss of confidence in the hospitals, and of course also indirectly a reduced confidence in the elected politicians. Explicit restructuring of the overarching structure for health care service including hospital designs in fact became necessary within the county of Dalarna. Actually, the hospitals required new functions.

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When elaborating on the matters brought forward above the recognition of a need for a restructuring must take into account the patients' total "chain of care", initiated at the very first visit at the emergency-unit or family doctor and ending by the final rehabilitation and the patients' returning to their "ordinary life".

In light of this restructuring process a new overarching structure for health care service in Dalarna is for the moment under construction, and in the future only Falun hospital will function as the more traditional, general hospital comprising in-patient surgery, acute care beds, etc.

On one hand, in order to achieve an appropriate organisation for support for e.g. follow-up care, care of every day illnesses, rehabilitation, etc., a new type of hospital is being crystallised. It is a hospital characterised by being easily accessible, especially for the elderly.

In Sweden this new type of hospital has been coined as “närsjukhus” in Swedish and here it will be referred to as the “nearby-hospital”. And in some aspects these types of hospital will have a non-traditional function.<sup>1</sup>

On the other hand, with support of telemedicine the general hospital in Falun will serve as a hub within a network of various types of decentralised nodes. Such nodes will consist of the “nearby-hospitals” and health care centres, but will also include family doctors and the homes of the patients.

The “nearby-hospitals” will mainly be dealing with out-patient facilities. This means that physicians specialised in general medicine and geriatrics will be responsible for the main part of the health care service provided. However, there will also be doctors specialised in gynaecology, surgery, internal medicine, psychiatry, etc., some of them full-time at the hospitals and some of them as consultants. There might also be a day-surgery facility. For children and younger patients concise competence ought to be at hand in the form of a “centre for children and youngsters”, organised in close co-operation with all categories of social workers, health-care service provided at schools, etc.

The “nearby-hospital” will also have a day and night service for acute medical care by doctors in internal and general medicine integrated with the work of an ambulance service (i.e. an emergency-unit on wheels) connected to more well-equipped hospitals, like e.g. the one in Falun.

The “nearby-hospital” will provide only a few beds for in-patient care. They will be available to patients who have been treated at the central hospital and no longer require that level of care. Also, some beds ought to be designated for shorter occasional stays especially for elderly patients. Rehabilitation on out-patient basis or in the form of day-care will also be important activities at the “nearby-hospitals”.<sup>2</sup>

The character of activities carried out at the “nearby-hospitals” will vary, and will almost certainly continue to do so, but an important task for the moment is to provide this new concept with a positive identity of fulfilling the function of a hospital able to offer easily accessible medical health care service.

Thereby the more traditional, general hospital will be able to concentrate its resources on patients who require a more comprehensive spectrum of competence, knowledge and equipment.

## 2 Some practical and theoretical frames of reference

Below in this section the problem area of health care service and hospital designs is treated by means of a matrix, previously explained by Engström, Gasslander and Wiklund (2002), but in this case elaborated by yet another column comprising the “health care product” (to the left in

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<sup>1</sup> Other synonym terms suggested are “neighbour hospital” or “neiborhosp.”.

<sup>2</sup> At the moment many of the more traditional, general hospitals in Sweden are changing into different types of “nearby-hospitals”. However, since there are, among other things, numerous different definitions of the “nearby-hospital” one of the authors is about to initiate a research programme at the School of Architecture, Chalmers University of Technology in order to study and refine this concept.

e 1). The matrix compares theoretical and practical frames of reference in both mechanical industries and the health care sector.<sup>3</sup>

The matrix is based on some of the authors' recent experiences concerning participation in the building design (and construction) processes of university buildings. Initially, the matrix underlines the need to transform the traditional public building facility (the "facility product") by means of established industrial product development methods (i.e. industrial product") into a more advanced product (Engström et al. 2001). Thereby it will also be possible to define yet another product for analytical purposes, namely the "health care product".

	THE "INDUSTRIAL PRODUCT":	THE "FACILITY PRODUCT" OF TODAY:	THE "HEALTH CARE PRODUCT":
Market characteristics:	<ul style="list-style-type: none"> <li>- Market research is mostly carried out.</li> <li>- For consumer products, strong competition exists.</li> <li>- For professional products and complete production systems there is an oligopoly situation.</li> </ul>	<ul style="list-style-type: none"> <li>- Delimited market research is carried out.</li> <li>- An oligopolistic situation, or most commonly a monopolistic situation.</li> </ul>	<ul style="list-style-type: none"> <li>- Delimited market research is carried out.</li> <li>- Monopolistic and omnipotent actors.</li> </ul>
Product development characteristics:	<ul style="list-style-type: none"> <li>- Fast product development for consumer products.</li> <li>- Slower product development for professional products and commodities.</li> </ul>	<ul style="list-style-type: none"> <li>- Slow product development since driving forces are mostly lacking.</li> <li>- Rational and systematic methods for product development exist but are mostly not used.</li> </ul>	<ul style="list-style-type: none"> <li>- Very slow product development due to lack of driving force except political.</li> <li>- Ethical driving forces go more for care than treatment.</li> <li>- Systematic product development and product definition is scarce.</li> </ul>
Product verification characteristics:	<ul style="list-style-type: none"> <li>- Very complex and time-consuming product verifications which are carried out regularly.</li> <li>- The user (customer) takes part directly in the verification process even in the early phases.</li> </ul>	<ul style="list-style-type: none"> <li>- Verification processes comprising user (tenant) participation are rare.</li> <li>- The user (tenant) does not always take part in the early phases.</li> </ul>	<ul style="list-style-type: none"> <li>- Verification process comprising larger groups of users (patients and employees) are rare.</li> <li>- The user is seldom involved in the early design verification phase.</li> </ul>

**Figure 1.** Some comparisons between the "industrial product", according to the tradition within the industry, and the "facility product" of today, according to practice within the building trade concerning market, product development and product verification characteristics according to Engström, Gasslander och Wiklund (2002). In addition the matrix also comprises the "health care product".

There are obvious similarities between industrial product development processes and the development of health care service (i.e. the development of the "health care product"). Both contain concentrated activities during a given period of time with a given set of objectives, and in which a number of persons with expert competencies develop a product with a given methodology in a structured way.

<sup>3</sup> The approach of letting the health care sector being mirrored with the mechanical industry should consider that a new manufacturing paradigm actually is at hand, and in fact it might be appropriate to use this knowledge as reference for the restructuring of e.g. the health care service.

Professional personnel responsible for developing the “industrial product” carry a role which is similar to their counterparts in charge of the health care service development. This especially becomes evident when observing that the industrial product development processes comprise so-called user-friendly products. It ought to be noted that it is a layman who is the consumer of the health care service, which also holds true for the “industrial product” in the case of consumer products. In the authors' opinion one of the merits of applying established industrial product development methods to the health care sector is that this will legitimise the restructuring process discussed above.

It might also be fruitful to elaborate the “health care product of the future” in accordance with the so-called “service product”. Of course, certain unique characteristics have to be considered like privacy, personal integrity, ethical circumstances, etc. (See e.g. Eriksson 1987 and 1988.) However, this type of argumentation underlines the need for a deeper understanding of how to interpret the term “health care product” which is touched upon below.

### 3 Elaborating on the meaning of the “health care product”

The specific meaning of the term “health-care product” may be interpreted in a number of ways. Below the authors have further elaborated on this specific matter by defining a matrix, composed of the treatment-oriented and care-oriented organisations compared with the care and the treatment-oriented “health care product” in order to mirror how health care and hospitals may be organised regarding e.g. layout, work organisation, choice and location of equipment, but also in order to reflect upon how the patient is treated (see figure 2). The matrix may function as a way of modulating the discourse even though this kind of reasoning might be perceived as somewhat controversial for some readers.

	Treatment-oriented organisation:	Care-oriented organisation:
The care-oriented “health care product”:	A: - A more traditional, general hospital, which concentrates its resources on patients who require a more comprehensive spectrum of competence, knowledge and equipment. This specific hospital will serve as a hub within the overarching structure for health care service.	B: - Health care service not necessarily provided at any sort of hospital, such as health care service not always carried out on hospital premises.
The treatment-oriented “health-care product”:	C: - Health care service not necessarily provided at any sort of hospital, such as dialyse carried out in the patients' homes.	D: - Health care service provided at the various decentralised nodes within the overarching structure for health care service.

**Figure 2.** A matrix is proposed above for the modulation of the discourse concerning the definition of the “health care product”.

To put it more specifically:

- The treatment-oriented organisation is mainly focused on direct treatment of the patients' illnesses leading to e.g. the employees in most cases prioritising immediate and objective results in form of the patients' recovery.
- The caring-oriented organisation, on the other hand, regards a well human being in a somewhat broader sense than just direct treatment. In this case the employees e.g. will in most cases prioritise the caring process itself in the form of an enhanced relationship with the patients, extending beyond the period of time required for direct treatment.
- The treatment-oriented "health care product" provides a speedy recovery and consequently the employees e.g. will in most cases support the patients' returning to ordinary life as soon as possible. This implies the perception of health care service as any other service product provided elsewhere.
- The care-oriented "health care product" aims at providing the patients with a service which underlines their expectation of sympathy, i.e. a personal confirmation of improved life, while not necessarily demanding a complete recovery. The patients will usually accept a dependence on other people for a rather longer period of time than is necessary for the direct treatment.

The matrix will consequently define the following combinations:

- The treatment-oriented "health care product" combined with treatment-oriented organisation (sector A in figure 2), a combination which most obviously may be transferable to the mechanical industries frames of reference, as has e.g. been the case in analysing surgery (Holmberg 1995). This combination will focus on a more direct treatment and the patients will accept a minimum of caring facilities in exchange for fast and efficient treatment.
- The treatment-oriented "health care product" combined with care-oriented organisation (sector B in figure 2), which is a health care service not always carried out on hospital premises. This may include palliative care and hospice. This orientation of organisation and "product" will be less productive from a direct treatment point of view but contains caring services and personnel with special attraction to these services.
- The care-oriented "health care product" combined with treatment-oriented organisation (sector C in figure 2), which also is a health care service not always carried out on hospital premises, e.g. dialyse carried out in the patients' homes.
- The care-oriented "health care product" combined with care-oriented organisation (sector D in figure 2) represents health care service provided to patients with e.g. chronic diseases and who need regular daily care.

To carry this discourse further: Along the lines of the matrix presented in figure 3 it is also possible to illuminate some characteristics and exemplifications of the interface in-between the patients and the employees at the hospital providing the health care service by defining a new matrix composed of treatment-oriented and care-oriented employees compared with treatment-oriented and care-oriented patients.

This matrix takes the more traditional, general hospital as a point of departure. It also exemplifies some analogies with the mechanical industry. Within this industry a sharp borderline between maintenance and manufacturing activities is at hand (i.e. maintenance means continuous service and preservation of equipment and other facilities, while manufacturing deals with manufacturing of products). These activities are usually regarded as specific and different activities which call for quite different organisations and employees' competencies.

	Treatment-oriented employees at the hospital:	Care-oriented employees at the hospital:
Care-oriented patients:	<ul style="list-style-type: none"> <li>- The (1) patients flow is focused, whereas the patients' need for continuity and care is neglected and (2) fluctuation in patients flow causes big uncertainties for the personnel. Thus leading to;                             <ul style="list-style-type: none"> <li>- patients flow fast or very fast,</li> <li>- short lead times,</li> <li>- the patient's psychosocial needs due to e.g. uncertainties are often neglected and</li> <li>- high mental and physical load on personnel.</li> </ul> </li> <li>- One example is ambulance and intensive care, due to the focus on treatment.</li> <li>- This situation may benefit by comparisons with e.g. logistics operations within the mechanical industry.</li> </ul>	<ul style="list-style-type: none"> <li>- An activity where the patients flow is slow. The caring process will be emphasised and much time and resources will be spent with the patients. Thus leading to;                             <ul style="list-style-type: none"> <li>- lead time less important,</li> <li>- social contacts dominating professional time usage and</li> <li>- many patients "in stock" and rational ways of handling the "stock".</li> </ul> </li> <li>- Examples: Geriatric and psychiatric clinics.</li> <li>- This situation may benefit by comparisons with production planning and scheduling operations within the mechanical industry.</li> </ul>
Treatment-oriented patients:	<ul style="list-style-type: none"> <li>- An activity where the patient flow is fast. Short lead times and little resources spent on caring services. Thus leading to;                             <ul style="list-style-type: none"> <li>- reduced number of looping (queuing) patients,</li> <li>- personnel competencies focused on treatment and</li> <li>- little social and administrative contacts between patients and staff.</li> </ul> </li> <li>- One example is surgery organisations in large hospitals.</li> <li>- This situation may benefit by comparisons with e.g. Just-In-Time principles and low stock of products in circulation used within the mechanical industry.</li> </ul>	<ul style="list-style-type: none"> <li>- The patient flow is slow, whereas patients expect a fast flow. Thus leading to;                             <ul style="list-style-type: none"> <li>- too many patients "in stock" and patients are looping (queuing),</li> <li>- patients expect fast flow short lead times, and few revisits; and</li> <li>- high mental load on both employees and patients.</li> </ul> </li> <li>- One example is primary hospitals with social ambitions and expectations.</li> <li>- This situation may benefit by comparisons with traditional maintenance operations within the mechanical industry.</li> </ul>

Figure 3. The matrix above exemplifies some typical activities within the traditional, general hospital regarding the interface in-between the patient and the employees at the hospital.

In short, the proposed matrix will for instance modulate the discourse specifically regarding how to interpret the term "health care product" which, if correctly communicated, in turn will facilitate an acceptance by both the patients and the employees, i.e. it will crystallise whether or not expectations between patients and employees are at hand.

In general this restructuring may be interpreted as follows: Instead of a polarised network comprised of a few number of general hospitals, it is a network transforming into a larger variety of small- and large-scale nodes and functions in which one of the nodes provides to

the needs of specialised health care service. This node, represented by the more traditional, general hospital will interchange health care service and patients with the “nearby-hospitals” and other nodes such as family doctors and homes of the patients.



**Figure 4.** The restructuring of the overarching structure for health care service will create a new type of network comprising various types of new nodes, which in some cases will fulfil somewhat non-traditional functions.

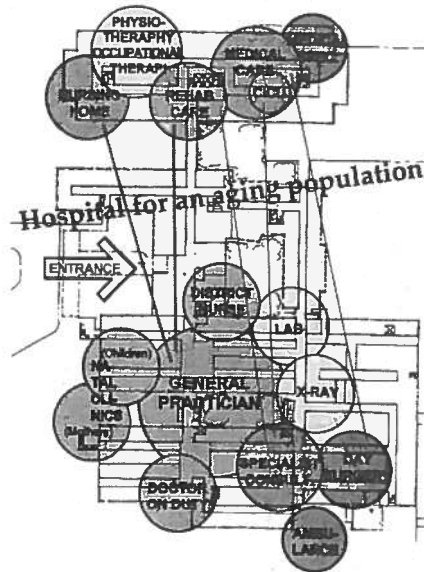
#### 4 Conclusions and final comments

In conclusion the frames of reference brought forward in this article have been elaborated by means of sketching a background which recapitulates some general recognised facts regarding health care service. Thereafter some practical and theoretical frames of reference were explained in accordance to the authors' earlier publications within the problem area of health care service and hospital designs. And these frames of reference were then used as a basis for elaboration on the meaning of the “health care product”.

For instance, the typology of “the zone-plan hospital” versus “the campus-plan hospital” is not sufficient to link the spectra of future hospital designs to their respective functions in the future overarching structure.

In addition, the modulations of the meaning of hospital designs (i.e. various types of master plans) will include a number of more autonomous and complete small-scale organisations, focused on the concentration of certain medical specialities, such as cardiology, neurology and orthopaedics in various types of centres (Wiklund 1996 and 2001) in a manner that has only been vaguely hinted at in this article and which is even less recognised in practice. Future research and development work within the problem area of health care service and hospital designs ought to comprise a typology for such designs.





**Figure 5.** Restructuring of overarching structure for health care service will influence the hospital design. For example, more traditional, general hospitals will be transformed into a number of more autonomous and complete small-scale organisations focused on certain medical specialities.

For example, it ought to be noted that patients today do not have much influence on the health care service provided. There do however exist different quality assurance institutions used by the mechanical industry and also public affairs auditors who ought to give some important input elaborating on how patients would like their interface with the hospitals to be organised. The patients ought in fact to be considered one of the new nodes, i.e. to be encouraged to carry out functions not traditionally recognised, all along the lines of the discourse brought forward above on the interface between the patients and the employees at the hospitals

Comparing with the earlier restructuring process carried through within the mechanical industry, the most radical step, and a key issue, was to delegate the responsibilities, combined with the means of fulfilling these responsibilities, to the operators on the shop floor. Along similar lines of thought the analogue would be to delegate more responsibilities to the patients themselves. This also implies a need for redefining the professional identities of the medical staff. In this case, present borders of responsibilities and authority between different categories of nurses, as well as between doctors and other categories of personnel, will have to be redefined.

In fact this procedure probably needs to be initiated before the patients come into contact with the hospitals. And further decisions may be distributed to an overarching coordinator who is in charge at the hospital and who is also responsible for the medical process of the patients. In order to be able to evaluate the medical status of the patients the coordinator will need adequate professional knowledge and experience. And apart from being able to fulfil traditional nursing functions the coordinator should also be able to, in communication with the patients, look into the patients' long-term development and in coordination with a colleague or a medical specialist consultant be able to prescribe general drugs.

In addition, it ought to be noted that health today is considered to be a more holistic concept embracing physiological, psychological and cultural aspects (WHO 2001; SFS 1982). Due to

its emphasis on a more individual and holistic patient care, i.e. a patient-oriented work organisation this new health paradigm has increased health care demands (Segesten 1997; SFS 1982) and it has also generated a need for an alternative design of health care buildings (Ulrich 1991).

Although the task-oriented work organisation is still dominant the new health paradigm has had an influence on patient care. New concepts and organisations have been developed, such as primary nursing care and patient-centred care (Adams, et al.1998; Segesten 1997). Thus the restructuring of the overarching structure for health care service including hospital designs will probably not be based solely on traditional competencies and specialities already at hand within the health care sector; external insight will most likely also prove to be of significance. This has been the case in the restructuring of the mechanical industry where social science, by means of educational training and work sociology, has proved to master the key expertise required for reforming an industrial icon, the assembly line (see e.g. Medbo 1999).

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