# Factors Influencing Networkability in the Health Care Sector - Derivation and Empirical Validation

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**In most sectors of the economy, holistic, local production structures based on manual labour have evolved into activities characterised by a high division of labour between service providers combined with specialisation, the standardisation of service components and extensive networking ("industrialisation"). In the health care sector, the first signs of a similar development are beginning to crystallise. A key concept for industrialisation is the ability to link up with other players on the basis of commonly agreed standards and services in the sector and low setup costs per case in order to jointly provide high-quality health care treatment oriented towards patient benefits. In this paper the main factors leading to an increase in this networkability are identified. The validity of the proposed factors is evaluated by means of an empirical investigation. The results of the investigation serve on the one hand to provide an overview of the areas where action is necessary to increase the networkability of individual players as well as that of the sector as a whole. On the other hand, these results can be used to obtain initial findings as to how health care players can control networkability on a holistic and systematic basis.**

**Keywords**

Business engineering, business networking, e-health, industrialisation of health care, networkability

## 1. Introduction

In industries characterised by intense competition and the associated constant pressure to come up with new designs for product and services, shorten processes and lower costs, it is very frequently the case that a high division of labour develops between service providers, which is accompanied by specialisation, the standardisation of service components and extensive networking [1]. In order to achieve or maintain competitive advantages many enterprises have therefore chosen to eliminate the classic company boundaries and to form collaborative networks or virtual enterprises [2], [3], [4], [5]. Up to now, the health care sector has only seen the beginnings of this development. In Switzerland, like in many other industrialized countries, it is still marked by monolithic structures with a low division of labour and low specialisation [6]. The fact that health care differs in structure from most other sectors is attributable to the high level of regulation which can hinder or prevent innovation,

the high proportion of government investment and the associated low pressure in respect of effectiveness and efficiency, the lack of orientation towards patient benefits and the widely differing interests of the individual players [7], [8], [9]. More recent developments such as e.g. the introduction of diagnosis-related group (DRG) systems[1] nonetheless provide a clear indication that the pressure to achieve effectiveness and efficiency is set to increase significantly. Moreover, demands for a patient-centred health care system and increasing informational self-determination on the part of patients in relation to therapy and financial issues can bring about a transformation of previous structures as well as a further intensification of the division of labour and specialisation. Networkability, in other words the ability to link up with other players in the health care sector rapidly and with low setup costs for the joint provision of services, will then take on greater importance.

This paper focuses on the networkability of the health care sector as the central issue shaping the extent of the division of labour and networking. In this context it will be necessary to clarify which capabilities health care enterprises will need to have in the future if they are to cope with the growing pressure for effectiveness and efficiency and actively control their position in the network.

Previous approaches have concentrated on considering the networkability of enterprises from the viewpoint of factors such as strategic positioning in complex value chains [10], the optimisation of business processes in networks [11], cultural aspects of networks [12], or information technology aspects such as the establishment of networking platforms [13], [14]. Other approaches are industry-oriented and have to be adapted to suit the special features of the health care sector [15]. The goal of this paper is to show the different perspectives on networkability by means of a framework and to derive the respective factors which influence the networkability not only of the health care sector as a whole but also of the players and individual enterprises within it.

For this purpose, the conceptual foundations of the framework are first discussed in the second section. This provides the basis for identifying the factors which can be directly influenced by an enterprise and the main environmental factors (which cannot be directly influenced) in the third section, and then proceeding to construct the model of networkability in the health care sector. In the fourth section the findings of a survey used to evaluate the results gained from the construction process are outlined. The fifth section is dedicated to a discussion of the results obtained from the survey. Finally in the sixth section, the main findings are summarised and subsequent research activities outlined in the outlook.

## 2. Conceptual Foundations

The health care sector encompasses a large number of stakeholders who pursue different interests and objectives. As an example, doctors should be able to concentrate first and foremost on the medical treatment of their patients, while the main emphasis has to be placed on the quality of the service provision. This orientation of the activity may conflict with the interests of the health insurance companies who are constantly looking at the economics of providing their services and also have to pursue their own business interests as well as the interests of patients in terms of low costs and hence low premiums.

This example shows that the individual players perceive the health care system differently in accordance with their individual roles. In order to be able to understand, explain and communicate this perceived reality, an explicit form of representation is needed in the form of an object system. The use of models to depict the object systems creates transparency and

[1] Diagnosis-related groups are a medical classification system for evaluating the necessary economic costs of a treatment. Although DRG is known since the early 1980's the Swiss and the German version of DRG (Swiss DRG / G-DRG) are still in the fledgling stages.

provides a common basis for communication of the changes which networking triggers for the various players in the health care sector (cf. Figure 1).

An object system reflects the perceived reality of a stakeholder or a group of stakeholders in the health care sector and also contains explicit or implicit ideas of how that perceived reality should change [16]. The individual object systems of the stakeholders can show strong interdependencies, which means that a modification in one object system can also cause a change in another object system.

The environment and the stakeholders' own interests and objectives can also lead to a change in their object systems. Examples include the increasing pressure for effectiveness and efficiency in the health care sector described above, which is triggered by annually rising health costs, or the demand for greater informational self-determination in the area of treatment triggered by political advances on the part of patient interest groups.

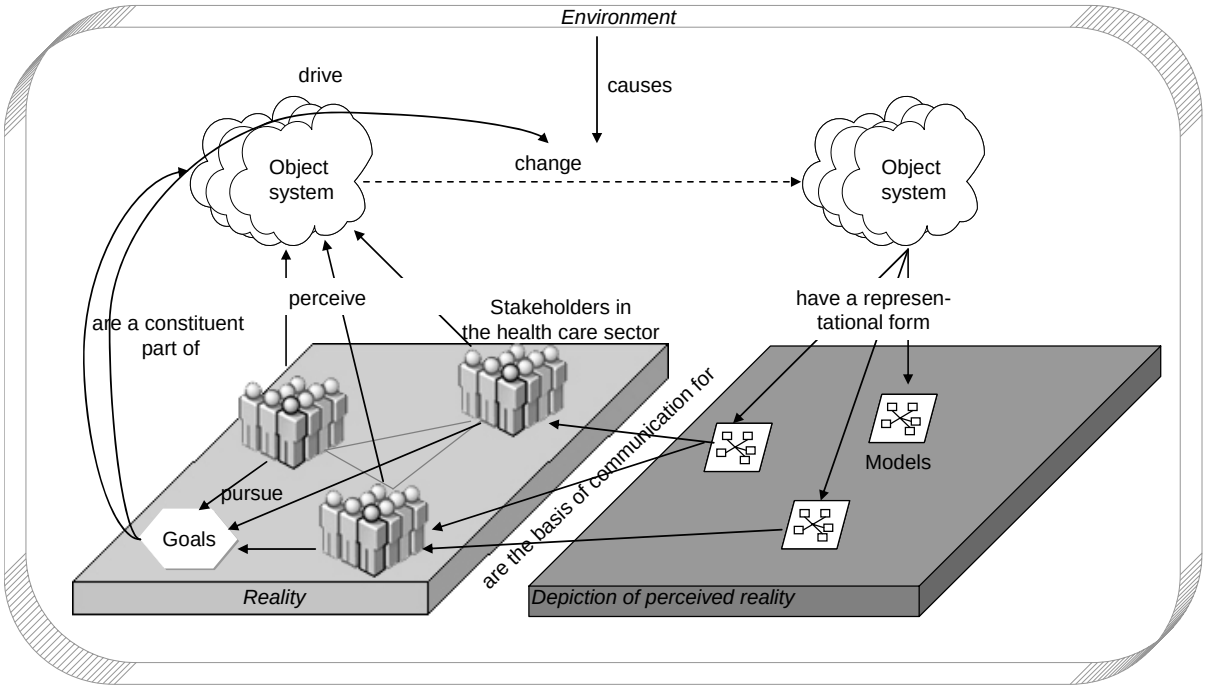



**Figure 1** Conceptual foundations of networkability in the health care sector after [16].

The basis for structuring a complex phenomenon such as the networkability of the health care sector provides a suitable framework. Frameworks are conceptual and heuristic aids for representing an object system. Conceptual means that they help to conceptualise and structure an object. Heuristic means that they can help to find a solution. The Business Engineering Framework[2] has proved useful as a generic framework for the new or redesign of a wide range of business areas (cf. Figure 2). Business engineering denotes the method- and model-based design science for enterprises of the information age [17]. The main characteristics of the business engineering framework are multiple perspectives and multiple layers. Amongst others, the positioning of an enterprise, its market services and goal system are analysed on the strategy layer. The organisation layer is used to consider processes and structures through which effectiveness and efficiency can be achieved. The support provided by information systems for business processes and structures is analysed on the system layer [17]. The business engineering framework was extended to include the dimension of the regulatory setting in order to be able include the domain-specific mechanisms in the

[2] For a detailed description of the essential layers and artefacts of the Business Engineering Framework and comparison with other frameworks see [18].

health care sector in the modelling. Change management is systematically considered across all the layers. This dimension of the change in culture and values is a central driver, on the hand as a trigger for change and on the other as a prerequisite for the successful "implementation" of changes [19].

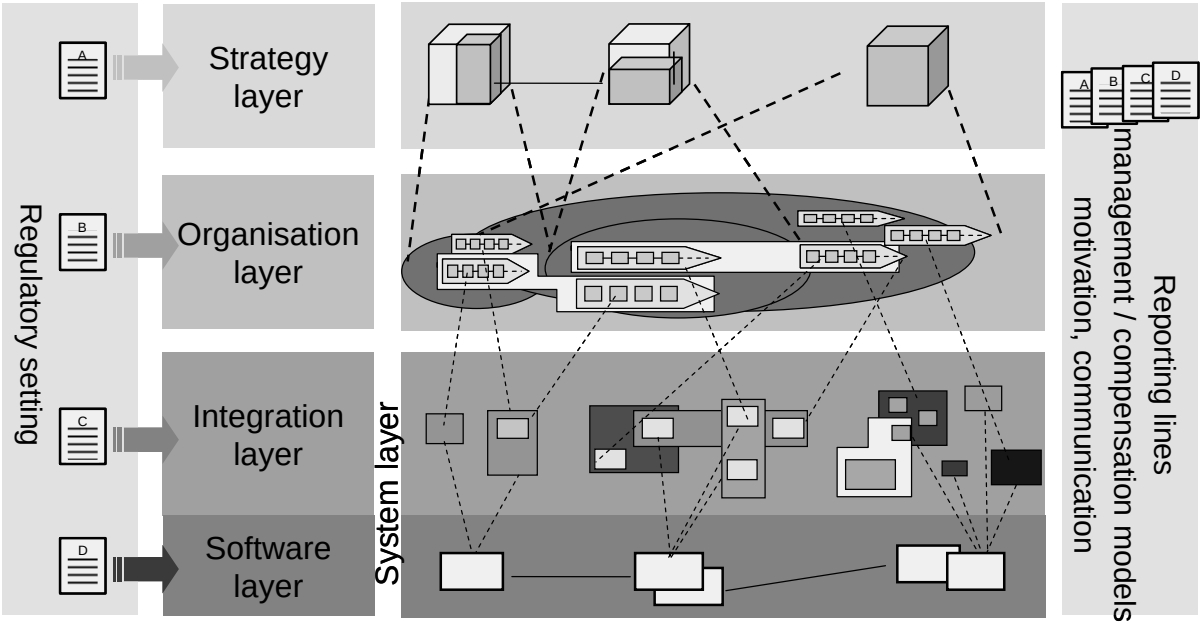



**Figure 2** Layers of the business engineering framework after [17].

## 3. Factors influencing networkability in the health care sector

In health care, and in particular in the area of public health, the use of focus groups is a proven qualitative research method for obtaining data [20], [21], [22]. Focus groups were also used for adapting the business engineering framework to include the regulatory setting and for initially defining the factors to be integrated into the framework for the health care sector in respect of networkability[3]. In order to obtain an in-depth insight into the major stakeholders, specific focus groups were used for specific players (hospitals, health insurance companies, service providers). These focus groups helped to define factors which in their view could contribute to an increase in networkability (cf. Table 1).

**Table 1** Extract from list of possible factors influencing networkability as seen by the different focus groups.

| **Focus Group/ Layer** | **Hospitals/Doctors** | **Health Insurance Company** | **Service Provider** |
|---|---|---|---|
| Strategy | ▪ Cooperation strategy<br>▪ Business-IT alignment<br>▪ Integration of ICT strategy into company strategy<br>▪ Cooperation | ▪ Shared networking vision<br>▪ Clarity of role within network<br>▪ Knowledge of synergy effects<br>▪ Divisibility of services | ▪ Networking motivation<br>▪ Inter-canton integration<br>▪ Incentive system<br>▪ ICT strategy<br>▪ Definition of market services |

[3] The applied organizational design for engaged research practice with focus groups is addressed in [23].

| | | | |
|---|---|---|---|
| | agreement<br>▪ Outsourcing | ▪ Standardisation of market services | ▪ Insourcing |
| Organisation | ▪ Exchange of knowledge in (IT) committees<br>▪ Project and application portfolio<br>▪ Process and quality assurance<br>▪<br>▪ Integration of IT and organisation | ▪ Network planning and control<br>▪ Isolatability of processes<br>▪ Transparency of processes<br>▪<br>▪ Distribution of responsibility/ control<br>▪ Standardisation of process outputs<br>▪ Type of organisational structure (function versus process) | ▪ Business hub |
| System | ▪ Standards<br>▪ Electronic Patient Records (EPRs)<br>▪ Service Level Agreements (SLAs)<br>▪ Enterprise Application Integration (EAI)<br>▪ Data protection during exchange<br>▪ Industry solutions<br>▪ Patient portals | ▪ Standards<br>▪ Isolatability of services<br>▪ Information flows between applications<br>▪ Integration architecture<br>▪ Access rights/ security<br>▪ Data warehouse | ▪ Standards<br>▪ Uniform architecture<br>▪ ERP<br>▪ CRM<br>▪ Supplier portals |
| Management, Behaviour, Power | ▪ Awareness on the part of the patient<br>▪ Awareness of information security | ▪ Team and communication capability<br>▪ Transformation capability<br>▪ Customer orientation | ▪ Corporate culture |

In addition, it was clearly confirmed by the focus groups that - unlike the case in industry and commerce - the health care sector is strongly affected by regulatory factors (e.g. through lists of services to be provided by public hospitals or statutory levels of cover by health insurance companies) over which players with no political or public role have little or no influence. In total, six regulatory (environmental) factors were identified: laws, politics, lists of services to be covered, research, interest groups and basic attitude of the general public to the issue of health and health care. These became design objects of the regulatory setting.

The design objects of networkability found in the focus groups were integrated into the business engineering framework and then consolidated by forming clusters of factors relating to connected topics. As an example, the cluster “performance management” was formed out of the stated factors “standardisation of market services”, “definition of market services”, “divisibility of market services”, “outsourcing of market services“ and “integration of market services”.

The identified clusters were in turn assigned to the respective layers of the business engineering framework (cf. Figure 3). Thus, for example, the clusters “cooperation

management", "incentive management", "performance management" and "ICT strategy" were identified on the strategy layer.

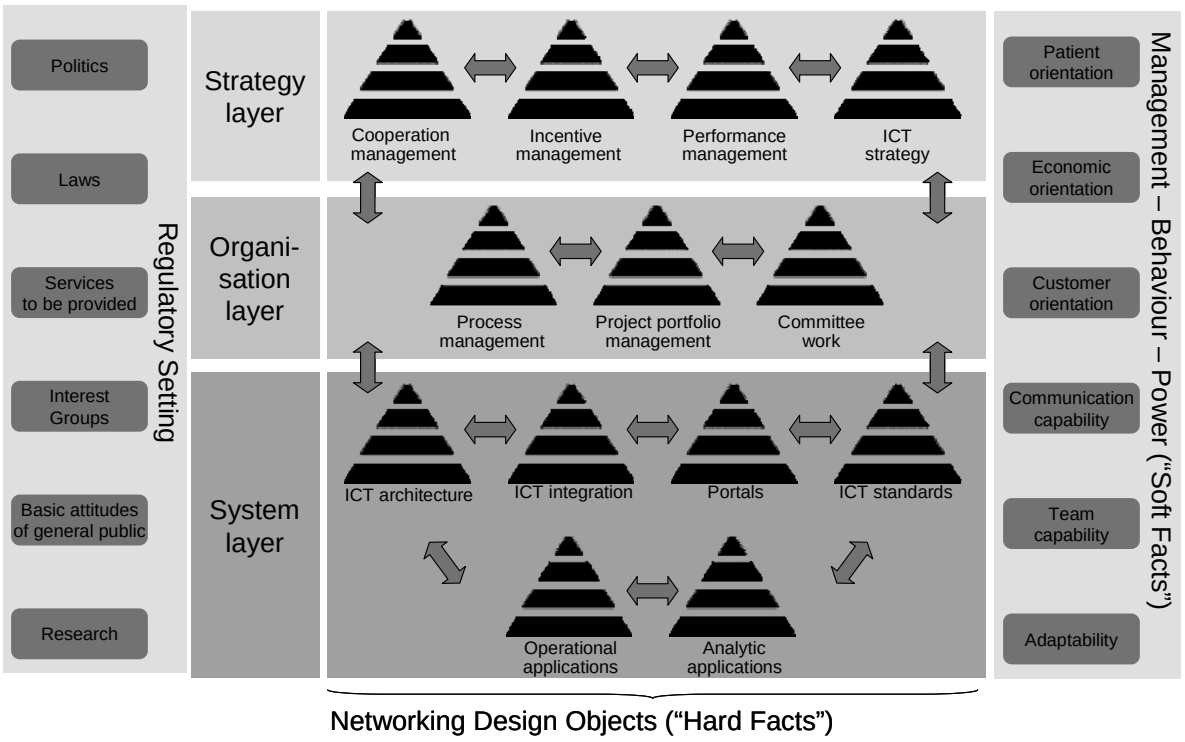



**Figure 3** Model of the clusters of factors influencing networkability in the health care sector.

By structuring the individual clusters on the basis of the business engineering framework, an influencing factor model is obtained which provides initial points of reference for the possible implications of a change in the object system. The following example is provided to highlight this fact. Two hospitals are planning to merge their hospital pharmacies and thus establish a central store to serve both hospitals (change to the cluster "cooperation management" in the factor "cooperation agreement"). The model of networkability now helps to identify possible implications. For example, it can be concluded that the prerequisites or consequences of such a project will be changes in performance management (factor "outsourcing of market services"), in process management (factor "isolatability of processes" and in ICT integration (factor "industry solutions") for both hospitals, and therefore a cross-layer and cross-partner design will be necessary.

## 4. Evaluation of the proposal

A major disadvantage in using focus group discussions lies in the lack of representativeness as a result of the small number of people surveyed (on average approx. 5-7 people per focus group). In order to obtain as wide coverage as possible for validation of the model, a survey was therefore conducted across Switzerland during the period from July to September 2006. The goals were to evaluate the suitability of the business engineering framework for the health care sector, to evaluate the proposed model of the factors influencing networkability in the health care sector and to identify further factors influencing networkability, which had not been previously taken into consideration.

The questionnaires developed for the survey were checked for comprehensibility and evaluability in pre-tests and with the help of expert interviews. A total of 500 people and institutions with a direct influence on the health care sector (doctors, hospitals, care centres,

health insurance companies, service providers, public administration, interest groups, etc.) were asked to take part in the survey. The response rate was 13%. Of the 65 questionnaires received in total, 45% were completed by doctors and hospital employees, 23% by employees of a health insurance company and 12% by employees of a service provider. Another 20% of those surveyed gave other areas (e.g. pharmaceuticals industry, public administration). 68% of the respondents described themselves as working in a management position. The remaining respondents were medical specialists (9%), IT professionals (11%), people working at the interface between medicine and IT (3%), or stated another function (9%).

Using a five-point Likert scale, the people addressed were asked about the influence of the factors identified in the focus groups using five batteries of questions in accordance with the dimensions and layers of the model of networkability in the health care sector (strategic, organisational, technical, regulatory, and management and behaviour-related design objects of networking). A distinction was made between the influence on the networkability of an enterprise and the influence on the networkability of the health care sector.

Furthermore, respondents were asked about the completeness of the model in a final battery of questions. It emerged that the financing of the network and infrastructural elements (amongst others for identity management and access management) should also be considered as design objects in conjunction with the networkability of the health care sector.

## 5. Interpretation of the results

Overall, the model of networkability based on the business engineering framework was confirmed by the survey since none of the clusters formed or the influencing factors represented by them was rated as insignificant for the networkability of enterprises and the sector[4]. Further analysis of the results was performed in accordance with the three dimensions of the model of networkability in the health care sector: regulatory setting (environment), management – behaviour – power ("soft facts"), and design objects of networking ("hard facts") (cf. Figure 3).

### *5.1 Regulatory setting (environment)*

On the whole, environmental factors (laws, politics, services to be provided, research, interest groups and the basic attitude of the general public) were considered by the respondents to be of little importance in respect of networkability within their own organisation. In particular, organisations with up to 100 employees considered the influence of networkability to be of little importance (cf. Figure 4).

[4] Since all factors show an influence on networkability, only the four relevant response scales are shown in the figures which follow.

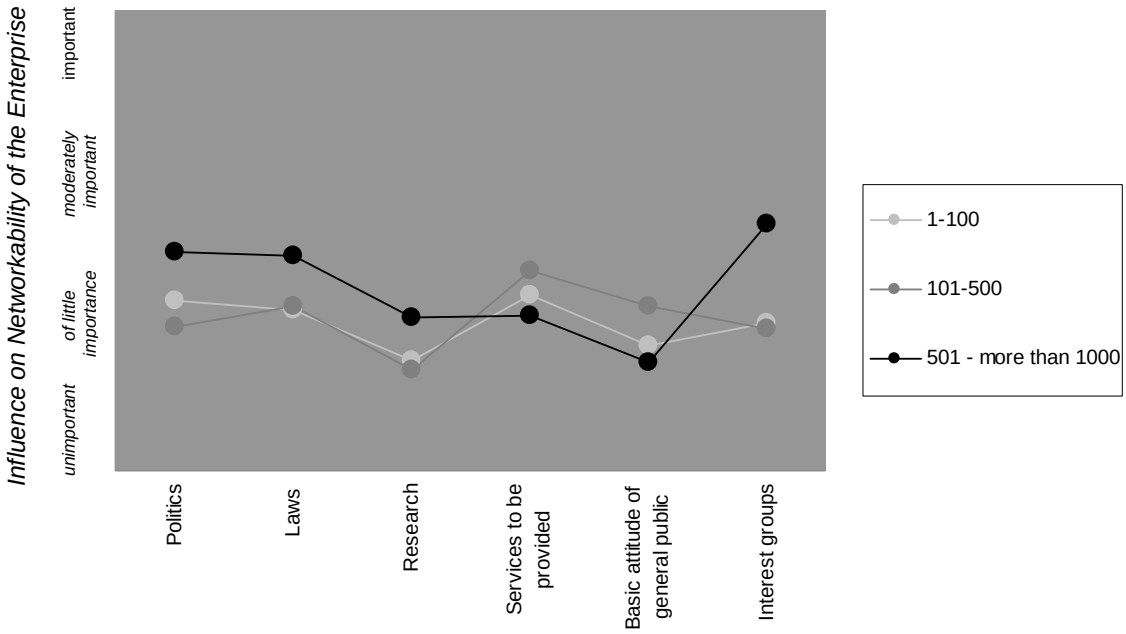



**Figure 4** Influence on networkability according to company size.

From this it can be concluded that the majority and in particular the players with lower numbers of employees have come to terms with or resigned themselves to the regulatory conditions in the health care system and consider it to be more important to concentrate on factors which they can directly influence (hard and soft facts). In contrast with their effect on the networkability of individual enterprises, environmental factors were, as expected, rated as moderately important for the health care sector as a whole.

### *5.2 Management – behaviour – power ("soft facts")*

Influencing factors relating to management, behaviour and power ("soft facts") such as adaptability, team capability, communication capability, customer orientation and economic orientation of employees were generally rated as moderately important for the enterprise (and slightly less important for the sector). Hospitals and service providers considered the adaptability of their employees to be particularly influential in increasing networkability (cf. Figure 5). This means that with regard to networkability the key to change is to be sought in behaviour or in the "soft facts". Furthermore, the transformation of monolithic structures into new, networked organisation forms can only be achieved in the health care sector by change management which is oriented towards the players and their motivation, dependent on context and nonetheless systematic. It also appears that any increase in networkability is closely connected with an increasing focus on the customer or patient. This substantiates the call for a patient-centred alignment of the health care sector [24].

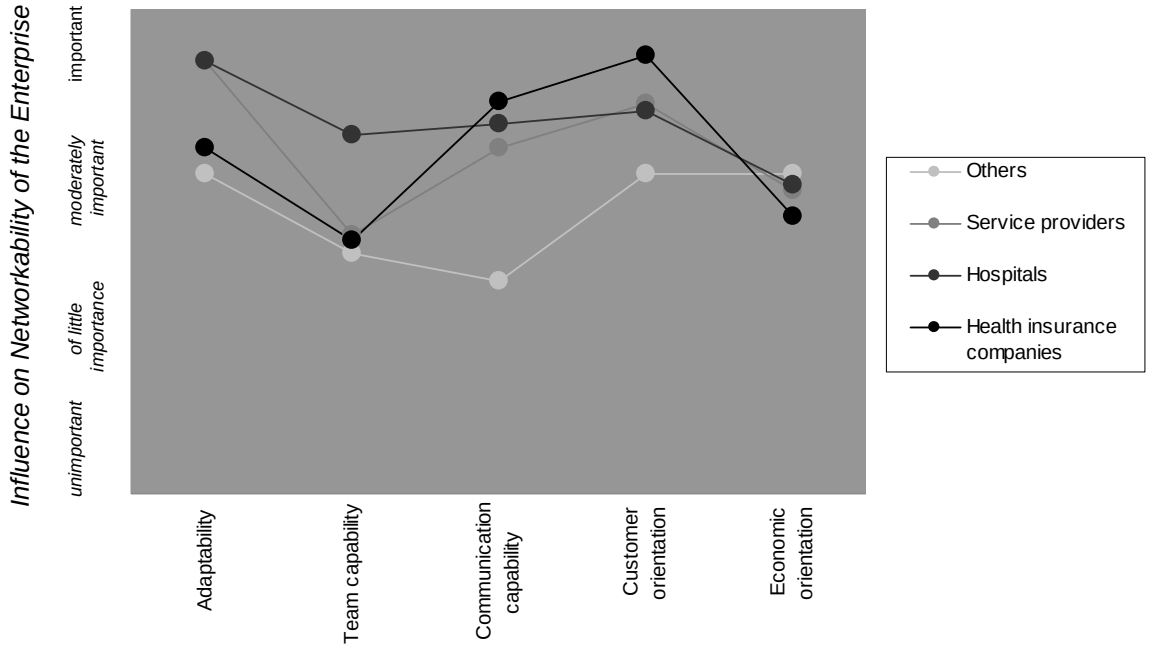



**Figure 5** Influence of "soft facts" on the networkability of the individual players.

## *5.3 Design objects of networking ("hard facts")*

It was also possible to prove the relevance of other influencing factors ("hard facts") which contribute directly to an increase in networkability. In order to analyse the "hard facts", the defined clusters (cf. Figure 3) were used for interpretation and structured according to the various players in the health care sector (cf. Figure 6).

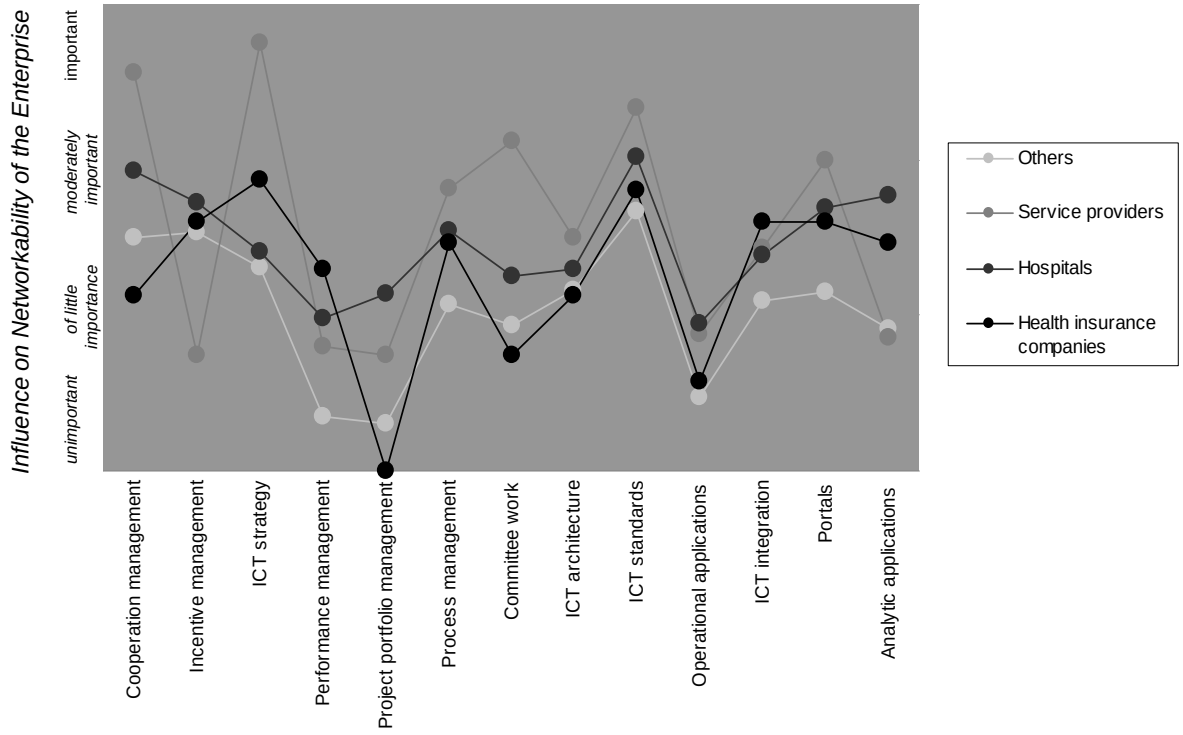



**Figure 6** The influence of "hard facts" on the networkability of the individual players.

As can be seen from Figure 6, considerable differences arise in some cases between the various types of enterprise when the individual clusters are considered. Larger differences between the players are shown in particular in the clusters cooperation management and in the importance of the ICT strategy. Whereas service providers rate cooperation management as having a high influence on networkability, health insurance companies see it as of little importance.

There are also differences in respect of the influence of the individual clusters on the networkability of enterprises and the sector. This was depicted in the networking matrix (cf. Figure 7). Here, it is evident that in the assessment of the respondents not all clusters have the same influence on the networkability of enterprises and the sector. The majority of the identified clusters are to be found in field A. These are the clusters which exert a moderate level of influence on both the networkability of enterprises and the health care sector. No clusters were assigned to field B, i.e. clusters with a moderate level influence on the networkability of enterprises and little influence on the sector. Also of interest for networking in the health care sector are the clusters in field C. These are the clusters with a moderate level of influence on the networkability of the sector but little influence on the individual enterprise. Clusters with virtually no influence on the networkability of enterprises and the sector are to be found in field D.

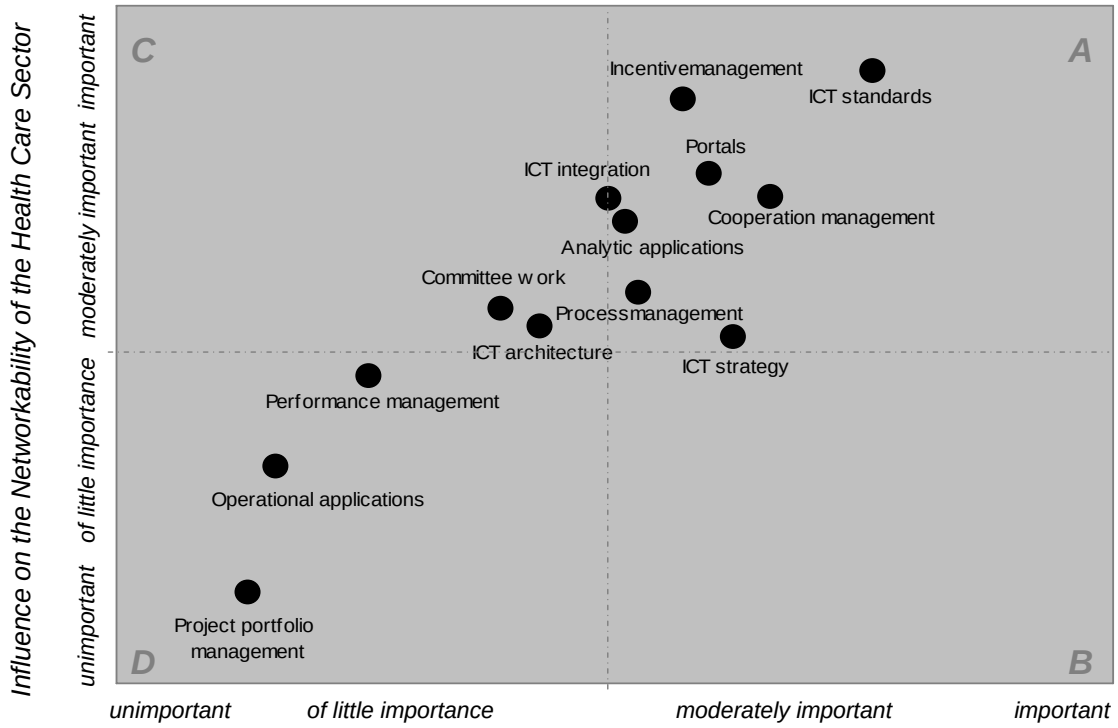



**Figure 7** Networking matrix.

## 6. Summary and Outlook

In this paper it was argued that the pressure for effectiveness and efficiency in the health care sector is set to increase as a result of new developments such as the introduction of case-based lump sums or the trend towards informational self-determination on the part of the patient in therapeutic and financial issues. In order to increase effectiveness and efficiency, service providers will undergo a fundamental transformation and align their value

creation directly with patient benefit. The ability to link up quickly and at low cost to provide joint services will gain in importance. The model of networkability constitutes a meaningful approach to identifying possible factors influencing the transformation. For this purpose, a total of 25 influencing factors which lead to an increase in networkability were identified by means of focus group discussions and assigned to one of the three dimensions of analysis (regulatory setting, design objects of networking and management – behaviour – power) of the business engineering approach adapted to the health care sector. As outlined in [1] the validity of the approach for strengthening the networkability of health care organisations needed an evaluation. This was done through a survey. It can be concluded from the results of the survey that the human factors ("soft facts") have a particularly strong influence on transformation of the health care sector. Furthermore, it was found that the regulatory setting is largely unimportant for the design, but is also seen as having little influence on an increase in networkability. The players do not tend to externalise the task of increasing networkability and concentrate on factors which they can influence directly. With regard to the factors (design objects) which can be directly influenced by enterprises, a clear statement can be made on the significance per type of organisation. An overall picture can be recognised from the networking matrix and the areas for action to increase networkability can be derived.

Building on the results presented in this paper, future work should be directed at prioritising areas for action in the sense of a roadmap for increasing the networkability of the health care sector. This leads to a clarification of the roles to be adopted by the players. This will enable the creation of reference models and methods to provide a more in-depth explanation of the identified design objects and their interaction.

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