

Integrated Delivery Systems in the Health Service: An Empirical Network Analysis

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Abstract

The health service is currently a central point of discussions in Germany. Stagnant receipts, coupled with escalating expenditures, pose a challenge for the German state in managing its health service. In order to overcome these obstacles the health service needs to be restructured. The concept of Integrated Delivery Systems (IDS) is developed to alleviate these cost and quality problems in Germany. This article defines the IDS and presents the basic success factors of IDS networks. In doing so, the concept of Mass Customization and the structure of Porter's (1985) value chain are taken into consideration. The identified success factors are validated empirically.

Keywords

German health care system, cooperation, network, integrated delivery system.

1 Introduction

„The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgement with which it is any where directed, or applied, seem to have been the effects of the division of labour.“ (Smith 1776) This statement of *Smith* (1776) refers to the enormous productivity caused by division of labour and specialisation which is however only one side. Division of labour and specialisation induces the necessity for exchange and cooperation. The various exchange and cooperation processes than utilize a portion of the productivity gains, e.g., in forms of time and money. In the German traditional health care system the underlying exchange and cooperation mechanisms waste

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the productivity gains of the division of labour and specialisation (Milgrom and Roberts 1992). The different care providers in the health care sector neither cooperate nor coordinate their offers. This leads to high costs, quality deficits, interface problems and discontinuities in the health care value chain in Germany. As a result, the traditional health care sector sets wrong incentives for the participants and therefore leads to inefficient and costly actions. The financial situation and the inefficient control systems in the German health service require a comprehensive restructuring of the system (Amelung and Janus 2005).

In this context, the concept of the Integrated Delivery System (IDS) was developed to alleviate the cost and quality problems in Germany. Its origin is the American managed care system (Kongstvedt 2001). The IDS provides efficient exchange and cooperation processes by using an adequate division of labour and specialisation. Thus, the difference between the achieved productivity gains through division of labour and specialisation and the reinvested productivity gains for the exchange and the cooperation is maximised. Due to the efficient realisation of the cooperation and the exchange structure within the IDS the participants face two main problems. These are the problems of coordination and motivation, caused by serious information asymmetries between the partners in the IDS. So called institutions are used for solving the coordination and motivation problem. Institutions are defined as sanctionable expectations which refer to the behaviour of one or more individuals. They are behaviour-steering sets of rules which set up new incentives and adapt the interests of the participants for a more efficient behaviour (Williamson 2000).

In the existing American literature, two reports of the Institute of Medicine (2001; 2002) demonstrate that inefficiencies in the health care system largely result from system problems rather than individual errors. Further studies in this context examine which institutional characteristics of managed care lead to better coordination and therefore improved clinical performance and patient satisfaction (Shortell and Smittdiel 2004; Himmelstein et al. 1999, Gillies et al. 2006, NCQA 2004). The studies to assess variations in inefficiencies, quality, patient satisfaction and care processes across organisations and delivery system types have not been consistent to define the causes of a higher quality and lower cost care yet (Miller and Luft 1994, 2002; Singh and Kalavar 2004; Miller 1992).

Although originated in the American managed care system, the German IDS has different institutional conditions caused by the different structure of the health care system. By now, most studies about the German IDS have analysed the acceptance of the patients and medical providers and general trends (Andersen and Schwarze 1999; Mittendorf and Schmidt 2006). The purpose of this study is to investigate which organisational characteristics of the IDS in the German health care system enable a high level of coordination and therefore lead to efficient care. First, the concept of IDS is presented briefly as a necessary institutional arrangement due to the increased division of labour and specialisation. Based on this general definition the success factors for an efficient design of cooperation of the partners in the IDS are identified and examined empirically.

2 Integrated Delivery Systems in the Health Service

By use of a general definition of cooperation, IDS can be understood as follows: The IDS is a cooperation of at least two care providers enabling them to offer health care to the patients in a way that an individual care provider could either not or only inefficiently produce (Axelrod 1984). The IDS is a network of medical suppliers which offer patients an optimal treatment designed to their specific needs and circumstances by combining the medications from selected care providers of the network. Such cooperation is usually long-term basis (Snow/Miles/Coleman 1992; Ménard 2004). The following analysis is based on this definition of the IDS.

The aim of the IDS can be viewed as the maximisation of productivity gains from an efficient division of labour/specialisation and an efficient exchange/cooperation. The patients should receive an economical and high-quality health care as opposed to traditional health care. It is expected that a cooperation of the medical providers reduces costs and rises the quality of the health care, e.g., by a common use of patient information. According to the Institute of Medicine “quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (Lohr 1990). Therefore, it is important to consider the patients’ and the medical providers’ perspectives.

In fact, the fundamental aim of the IDS is to achieve a higher quality while simultaneously reducing costs. The assumption of a trade off between quality and cost is not permissible. The aims of quality and economy mainly do not conflict each other but rather are perceived as being complementary aims or strategies.

First, due to a reduction of treatment mistakes the quality can be improved and the costs lowered at the same time (Porter and Teisberg 2006). An international study of the Commonwealth Fund (CWF) shows that treatment mistakes occur in nearly one fifth of the treatment processes (e.g., 19% in Germany, 22% in the US) (Commonwealth Fund 2005).

Second, the present health care is characterised by a lack of exchange and cooperation and therefore by temporal delays in the health care value chain. Through constant coordination of the medical providers complications and repeat visits caused by belated treatment can be prevented or reduced (Porter and Teisberg 2006). Overall, a constant and continuous treatment and a well coordinated medicament therapy can improve the quality and reduce costs simultaneously.

In summary, improving quality can lead to lower costs in health care. Mainly it is assumed that an insufficient quality or so-called *poor quality* raises long-term costs (Porter and Teisberg 2006). The cause for increased quality and lower costs can be the improved coordination processes and thus an efficient institutional design of the IDS.

3 Mass Customization

The approach of Mass Customization brings *Porter's* (1985) two generic competitive strategies cost leadership and differentiation in agreement. In the cost leadership strategy, a firm tries to become the low-cost producer in its business. In the differentiation strategy, a firm is striving to become unique in its business along some dimensions that are widely valued by the consumers (Porter 1985). Mass Customization does not set the focus on just one of these two strategies. In fact, Mass Customization in the context of the IDS aims to offer the patient a combination of cost- and customer-oriented health care.

Mass Customization means producing a good or a service in response to the needs of an individual customer in a cost-effective way. "Mass Customization calls for a customer-centred orientation in production and delivery processes, requiring the company to collaborate with individual customers to design each one's desired product or service, which is then constructed from a base of pre-engineered modules that can be assembled in myriad ways" (Pine, Peppers and Rogers 1995).

According to Mass Customization, the IDS could offer each patient the exact health care service that is corresponding to the individual patients' needs. Due to such individualisation, the costs of the health care do not rise, but remain constant or even decrease. Individualisation and standardisation of the common service process are to be brought into reconciliation. Even though substantial investments may be required for the implementation of new processes and technologies, the health service of an IDS produces lower costs compared to isolated medical providers and is therefore economically advantageous in the long-term. In order to introduce Mass Customization successfully in the IDS it is necessary to proceed the following steps:

In the first step, processes have to be developed which are repeatable and stable for the production of the health care service, with the intention of being able to realise the efficiency advantages of Mass Production. In contrast to the Mass Production, the processes in the IDS are not strictly hierarchical organised with few information flows. Therefore, in the second step the individual medical providers have to be connected to achieve a continuous information exchange and horizontal process focusing. That way the treatment processes can continuously improve and be adapted to the patients (Pine, Victor and Boynton 1993).

In the third step, Mass Customization requires each medical provider to view himself as a module or an element of the entire health care value chain. Each module as an efficient component of the health care value chain concentrates on its core competence and specialises in a certain part of the medication process (Pine, Victor and Boynton 1993). Services usually consist of sub-processes per se in contrast to physical goods. Therefore, it is easier to define the modules (Shostack 1984).

It is important to assure that the modules and therefore the activities of the medical providers are specialised and standardised on the one hand. On the other hand, the activities of combining those modules to ensure a comprehensive

treatment have to be standardised for an instant, costless, seamless and frictionless connection, too (Pine, Victor and Boynton 1993). Without these conditions the companies cannot customise a fairly large amount of goods and services for each individual customer at relatively low costs (Pine, Peppers and Rogers 1995). The modules of the network do not interact in the same way every time. Rather, the modules' combinations change constantly based on each customer's desires and needs which has an individualisation effect on the treatment.

The fourth step is the ongoing adjustments and renewals of the entire treatment process to new market opportunities and changes which always let the cycle restart at the first step. Recognising and considering the trends is an important factor of Mass Customization. A so-called learning organisation enables the partners of the network to continuously improve the efficiency and individuality of patient-oriented health service. The experiences with the patients are used to improve future treatments, too (Piller, Moeslein, Stotko 2004).

In summary, the entire health care value chain in the IDS must be developed. The individual treatment steps of the medical providers have to be stabilised and have to be seen as standardised modules. In order to integrate these modules patient-oriented, a standardised linkage system has to be used. Additionally, the entire treatment process and cooperation has to be adjusted and renewed continuously due to changing external conditions or internal improvements.

To structure the implementation of Mass Customization and to identify the main success factors of an IDS the competitive value chain by *Porter* (1985) is used. *Porter* arranges the firm's activities according to the creation of value. This basic concept of the value chain of an individual firm will be applied to analyse the IDS. However, the value chain of each individual medical provider is not viewed isolated. These individual value chains are linked together to create a superior health care value chain which is in the focus of this study. The integration of the medications from the different IDS partners needs to be analysed and the focus is especially on those activities which are substantial components of cooperation. A closer view on competitive advantages according to the value chain by *Porter* (1985) is not being taken.

The activities in the context of the firm's value chain and therefore of the entire health care value chain of the IDS split into primary and support (secondary) activities. Primary activities in the IDS are medical treatments that are directly provided to the patient by the medical provider. Primary activities are activities such as prevention, curation, rehabilitation and nursing. The support activities of the firm's value chain are the infrastructure, the procurement, the technology development and the human resource management (*Porter* 1985). They support the primary activities and therefore the cooperation activities in the IDS. Below, these activities are described briefly and transferred to the success factors of the IDS, considering the characteristics of Mass Customization.

4 Success Factors of Cooperation in the IDS

4.1 Infrastructure

The fundamental activities of a firm infrastructure are planning, finance, accounting, quality management and government affairs. These activities usually support the entire value chain (Porter 1985). Transferred to the IDS, activities which are specified in detailed contracts and provide and strengthen the entire cooperation become essential.

Detailed contracts provide a basis for the cooperation in the IDS. The medical providers can understand and transform the aims and contents of the cooperation only if a detailed contract is provided. Such a contract contains partners' responsibilities and competencies, the specification of the partners' requirements as well as a clear formulation of the aims and strategies of the IDS.

The detailed IDS contract allows partners to identify who the correct partner for their specific treatment is and therefore what kind of contribution each partner can make to the entire health care value chain. The patients then can be referred to the next appropriate medical provider in the health care value chain. The danger of trying out a medical provider and thus a possible false referral can be reduced or even prevented. This can lead to patient satisfaction.

In accordance with the attributes of Mass Customization the contractually specified medication bundles of the partners can be seen as modules of the entire health care value chain. The work of each medical provider is as relatively autonomous operating unit and therefore a standardised module of the health care value chain. Besides, scale effects and stronger specialisation of the medical providers in their field of activities can be obtained by the modularity of health care bundles (Pine, Victor and Boynton 1993).

H 1: Contractually fixed treatment bundles of the partners in the IDS positively affect the quality from the patients' point of view.

4.2 Procurement

The activity of procurement is the purchasing of the inputs in the value chain. This activity is not to be confounded with the inputs themselves (Porter 1985).

The medical providers in the IDS can offer the patient health care by combining their medication modules. However, this requires the exchange of information about a wide range of details. This counts for general patient history and treatment activities of the medical provider, for example.

By using the characteristics of Mass Customization the health care bundles of the medical providers must be compatible with one another. The information procurement is necessary to interconnect the modules and to offer a comprehensive and continuous health care service. Creating both technical and

organisational conditions ensure efficient and compatible information procurement. The technical requirements include the integration of the partners' IT-systems to a universal network. This promotes shorter response times, a Just-in-Time production, reduced waiting periods and resting times in the entire health care value chain of the IDS. Hence, efficiency advantages can be achieved by favourable time frames and faster patient treatment. This is supported by the characteristics of the IT-systems which make information directly available to the medical providers at any given time and place. However, incompatible file formats, heterogeneous IT-infrastructures and medium disruptions can slow down or prevent the information flow.

H 2: IT-systems establish compatibility between the modules and therefore increase the quality from the medical providers' (2b) and the patients' (2a) point of view.

Due to common IT-systems, patient data from a large amount of users can be locally entered, but centrally saved. This centrally saved information can be the basis for a communication and information flow. Moreover, a compatible IT-system makes it possible to supplement patient information comprehensively and constantly with current information. Previously entered information can also be accessed. The centrally stored patient-specific information is used for a "Learning Relationship" which is an instrument of the Mass Customization. The more patients contact the medical providers, the better the medical providers obtain information about their needs and preferences. A "learning" common (documented) treatment history of the patients in the IDS allows a more precise fulfilling of their needs and desires over the time (Pine, Peppers and Rogers 1995). "Learning Relationship" is an individual, faster and stronger consumer relationship which eventually becomes more intensive.

In this context, the condition for information procurement must be created within the organisation. It is not enough to implement only a uniform information system and/or an integrated information structure in the IDS, but organisational conditions such as agreements must be also created. These agreements should define how the IT-systems have to be used and maintained, so that a "Learning Relationship" can be ensured. The IT-systems have to be integrated efficiently into the treatment process and the systems' application has to be standardised. If the medical providers in the IDS agree to document information centrally, this data can be used to increase the information procurement and information exchange in the network. In addition, agreements about communication and information transfer contribute positively to the information exchange and information-sharing operations.

In total, connected IT-systems and agreements about the (central) collection of the patient-specific information and knowledge lead to a compatibility of modules and therefore facilitate and increase the information exchange. The information exchange can support or make the coordination possible. The treatment steps of the IDS' partners can then be coordinated with one another so that the division of labour and consequently the individual interfaces do not negatively affect each

other. The complications and errors throughout the entire treatment can finally be reduced so that the partner of the IDS can offer the patient a continuous and patient-oriented health care at low costs.

H 3: Agreements about the collection of patient-specific information facilitate the linkage of the modules and increase information exchange. This again leads to an increase of coordination (a) which enables a higher quality from the medical providers' (c) and the patients' (b) point of view.

4.3 Social Capital

The activities of human resource management are recruiting, hiring, training and compensation of all employees (Porter 1985). In particular, these activities refer to the human capital. Transferred to the IDS and an entire network however the necessary attention must be given to the social capital in contrast to human capital. While social capital refers to the relations of the individuals amongst each other (Burt 2000), human capital is defined as the characteristics and abilities of the individuals themselves. Therefore, social capital can be seen as complementary to human capital (Coleman 1988).

Social capital can be defined as “features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit” (Putnam 1995). Fundamentally, three dimensions of social capital exist: the structural, the relational and the cognitive dimension of social capital. All dimensions represent characteristics of a social structure which promote the social interactions between participants (Nahapiet and Ghoshal 1998). This facilitates the compatibility of the medical providers' modules and their linkages.

The structural dimension describes the impersonal configuration of linkages between the medical providers' of the IDS (Nahapiet and Ghoshal 1998). The structural dimension of social capital is faded out in this analysis, since the differentiation of strong from weak structures is covered by other success factors.

The relational dimension of social capital positively affects the motivation of participants. In the context of IDS, trust, identification, obligations and expectations (reciprocity) belong to this dimension. Trusting each other, identification with the IDS and reciprocity stimulate the readiness to pass information and knowledge. The process of the common production will possibly be more transparent and this again leads to rising confidence. Without trust, identification and reciprocity additional coordination processes and agreements between the participants could be necessary to ensure the compatibility of the network's modules (Lesser 2000). In total, medical providers who trust each other can substantially improve the quality of the health care in the IDS.

Furthermore, the informal relational dimension of social capital can in the long term supplement or even substitute formal institutions, e.g., contracts. Complex control mechanisms can be attenuated and thus savings of transaction costs occur.

H 4: The relational dimension of social capital enables a higher information exchange and hence higher coordination (a) which lets the quality rise from the medical providers' (c) and the patients' (b) point of view.

Beyond that, the relational dimension can affect the cognitive dimension positively through a higher frequency of interactions. The cognitive dimension of social capital covers the shared language and knowledge of medical providers in the IDS. This can enable effective communication, complex interactions and common knowledge-based treatments of the patient. Therefore, the cognitive dimension can increase information exchange and coordination which rise the ability to implement common treatments effectively and without friction losses. The compatibility of the medical providers' modules in the IDS can be ensured and the quality of the health service can improve. (Nahapiet and Ghoshal 1998).

H 5: The cognitive dimension of social capital in the IDS increases the compatibility of cooperation. Thus, information exchange leads to higher coordination (a) and therefore to higher quality from the medical providers' (c) and the patients' (b) point of view.

Altogether, social capital has a positive effect on the compatibility of medical providers' modules which is required by Mass Customization.

4.4 Technology Development

Following *Porter*, the activities of technology development include those which aim at product and process improvement, e.g., document execution, goods transport or product embodied technology. The IDS tries to offer patients a complete solution for their problem, the disease, which corresponds to their individual needs. The functional organisational structure is replaced by a patient-oriented structure (Burns 2002). In comparison to the traditional health care system the patient-individual treatment represents a process improvement.

Mass Customization does not only focus on individualisation itself. Furthermore a flexible combination of standardised modules of the medical providers is used to produce an individualised health care service. The condition of the standardised modules was primarily created by detailed contracts (see infrastructure). The compatibility of the modules can be ensured both by uniform IT-systems, by agreements about information procurement (see procurement) and by social capital (see social capital). Even if the modules of the treatments can be combined patient-individually, the process of configuration and combination of the medical providers' modules can be standardised in an appropriate way. It has to be noted, that only after identification of the needs production takes place.

In summary, the modules of the individual medical providers in general and the connecting paths are standardised but the selection and number of modules is determined individually and flexibly for each patient. Those medical providers

have to be selected from the IDS which can offer the largest contribution to the treatment under aspects of costs and quality.

Guidelines and well-tried process cycles in the treatment process can make a substantial contribution to combine the modules in a standardised way (Field 1991; Field and Lohr 1993). Therefore, the standardised treatment paths and guidelines can be seen as a linkage system in accordance to Mass Customization. However, it is important that the treatment liberties are not too limited by the standardised linkage system and exclude possibly efficient single treatment steps for a specific patient. Principal purpose should be to efficiently integrate the sub-processes to a common health care value chain.

H 6: A standardised linkage system combines the treatment parts of the medical providers to increase the coordination and the quality from the medical providers' (c) and the patients' (b) point of view.

In addition, the quality circles and the secondary opinions can be seen as instruments of individualisation and positively complement the standardised treatment paths. These instruments can have a direct positive effect on the quality of the health service. Quality circles are (small) groups of medical providers which cooperate in order to exchange themselves about technical and patient experiences. Quality circles can be organised voluntarily or obligatorily in the context of the IDS. The frequent patient-specialised and documentation-supported discussions in small groups exceed most traditional and legally binding advanced trainings (Specke 2005). Beyond that, the partners can decide, e.g., before a referral to a hospital or a special operation, to take a secondary medical advice of another medical provider.

Altogether, standardisation and individualisation have to be balanced in accordance with the Mass Customization. The adequate standardisation and individualisation of the treatment process can be seen as the linkage system between the medical provider's modules in the IDS.

H 7: An adequate degree of individualisation in the health care value chain can increase the quality from the medical providers' (7a) and the patients' (7b) point of view.

Furthermore, the patient is physically present on every step of the whole service chain. Therefore patients are at any time involved in the treatment process. IDS is a service network. The latter differ from networks in the material goods industry. The customers from a service network go through the complete service chain and thus get in contact with each individual enterprise from the service network. In contrast, customers of a material goods network only interact with the last enterprise in the entire value chain, the distributor (Burns 2002). Hence, in the IDS as a service network the interfaces between the patients and each medical provider must be arranged. The medical providers in an IDS must specify in which extent where, when and how the patients (as a co-producer or as an informant) take part in the health service treatment (Fliess and Kleinaltenkamp 2004).

Consequently, it has to be pointed out to the patients, how and where they have to participate in the treatment, in order to obtain an efficient patient integration.

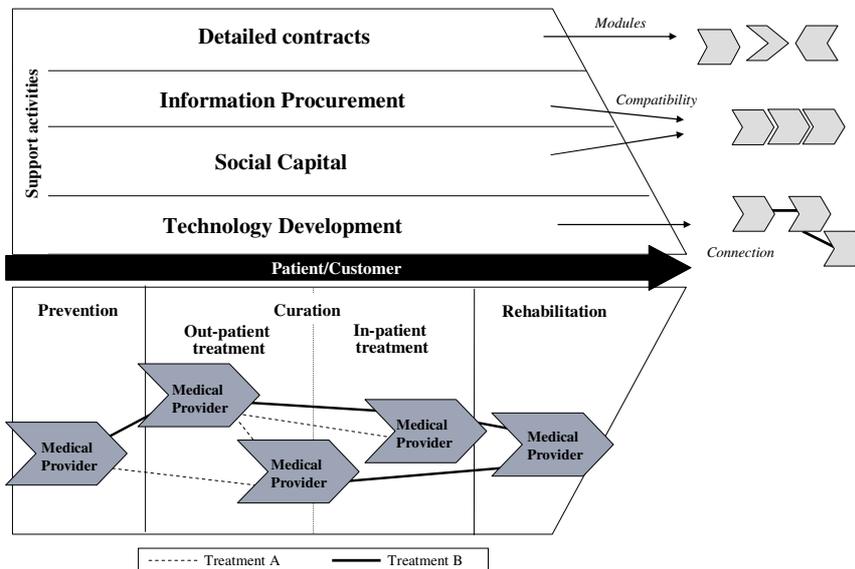
The medical providers must provide the patient transparency over the service process, in order to equip the patient knowledge over the execution of the treatment. As a result, inhibitions and uncertainties can diminish and the patient can actively take part in their own treatment and rehabilitation (Toffler 1980; Davidow and Malone 1993; Parsons 1964).

In summary, activities of the medical provider and the patient have to be combined so that a trouble-free, economical and smooth patient integration is obtained and the patient is affected to make a productivity- and quality-promoting contribution to the health care. This can improve both the costs and the quality conditions.

The process of the patient integration also corresponds to the Mass Customization, because, by the active integration of the patient, the coordination and integration can increase and thus influence again both the costs and the quality positively. A method to implement the patient integration is Blueprinting in the context of Mass Customization. Blueprinting provides transparency about the health care value chain to the medical providers and patients. By using Blueprinting, the optimal individual subprocesses of the value chain are illustrated along the time axis of the treatment. Within the subprocesses the activities of medical providers and patients are represented (Shostack 1984; Fliess and Kleinaltenkamp 2004).

H 8: An active patient integration can contribute to a better coordination of the processes (8) and increase the quality from the medical providers' (c) and the patients' (b) point of view.

Figure 1. Success factors of the IDS



The first results from chapter 4.1-4.4 are summarised in Figure 1.

4.5 Opportunistic Behaviour

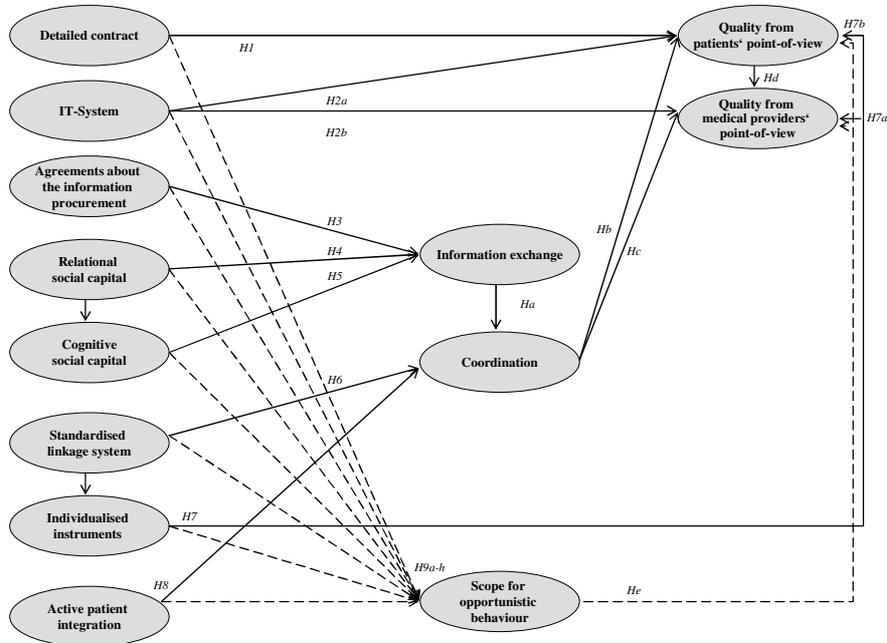
Bundled competences in the IDS which work patient- and process-referred, can create conditions for the recovery of the coordination problem, in order to be able to achieve productivity gains following *Smith* (1776). Additionally, as mentioned at the beginning of the article, for an efficient exchange and cooperation as a counterpart to the division of labour the motivation problem has to be solved, too. So it has to be investigated whether apart from the coordination problem also the motivation problem is handled in an appropriate way. In particular the motivation problem will be managed, if the individual objectives of the network's medical providers are in accordance to the objectives of the IDS. An incentive-compatible organisation concept has to be worked out to bring the individual objectives of the medical providers and the whole network objectives in line (Milgrom and Roberts 1992). The scope for opportunistic behaviour has to be reduced so that the probability that partners cooperate as agreed is maximised. The most important conditions for an incentive-compatible organisation concept which can induce cooperative behaviour are financial incentives. It is important to determine that IDS bear the economic responsibility on a long-term basis for the patients of the network. If a medical provider, e.g., an acute hospital works isolated, it does not carry the economic consequences of its action. It is generally able to shift a majority of low treatment qualities and additional costs of the health care to other medical providers, e.g., the rehabilitation. Therefore, the isolated working medical provider will rather bend to reduce the quality, in opposition to medical providers which are integrated in all supply stages and receive a fixed charge for their treatment of the patients on a long-term basis (Shortell and Hull 1996).

In the following, I will examine empirically in what respect the described success factors per se limit the scope for opportunistic behaviour. I will not investigate the motivation problem itself in detail.

H 9: The scope for opportunistic behaviour can be reduced by infrastructure (9a), the information procurement (9b/c), the social capital (9d/e) and the technology development (9f-h). A reduction of the scope for opportunistic behaviour increases the quality of the health service again (e).

The elaborated hypotheses are represented in Figure 2 in a structural equation model. Hereafter, they are examined empirically.

Figure 2. Structural Equation Model



5 Method

The design of the empirical analysis must correspond to the hypotheses, the objectives and the theoretical analysis.

5.1 Sample and data collection

The question of investigation in this study requires a sample of persons who are both medical provider and active participant of an IDS in Germany. Only these kinds of persons had the chance to gain (first) experiences and are appropriate to test the hypotheses and to assess the connection between cooperation and the factors quality and costs.

To collect the sample data, a written anonymous and standardized questionnaire was used. Before the data collection started, the provisional questionnaire version was pretested. The data collection was compiled in the period of November 2006 until February 2007. For practical reasons the questionnaire was accessible online

in order to make a direct and easy completion at the screen possible. Besides this online version, the questionnaire was available paper-based.

In summary, the survey conducted 141 medical providers of a German IDS. 19 answered questionnaires were sent back by mail and 4 by fax. 118 questionnaires were filled out by medical providers online. In account of too many missing values, 31 incomplete questionnaires were insufficient for further consideration within the analysis. Thus, 110 questionnaires remained for further analysis.

In comparison to other studies of the IDS a sample of 110 data records can be considered as representative and acceptable. E.g., Wagner and Lenz (2007) work with a random sample of 75 medical providers of a German IDS. In Germany, the total number of medical providers working with IDS is not known. Therefore, it was not possible to draw a random sample over all medical providers which participate actively in an IDS. Rather, the database of 141 medical providers which work in IDS network is the result of an own comprehensive research within IDS.

5.2 Measurement

The success factors (infrastructure, procurement, social capital, technology development) and result factors (quality from the medical providers' and the patients' point of view, information exchange, coordination) of health care are latent variables. Therefore for each of the success factors and result factors a set of indicators was derived in order to make them accessible to a quantitative measurement. Objective indicators for measuring costs and quality of the IDS do not appear to be reasonable, because the comparison of the individual medical cases is not possible, e.g., the average absolute spending time for each type of disease is different. Heterogeneous health service treatments for each indication exacerbate or preclude the comparison with objective indicators. Thus, superordinated indicators were used to measure the simultaneous quality increase and cost reduction, e.g., complications and errors in the treatment. The study can be seen as a research fundament which is extendable through additional aspects in further analyses.

As a result, the subjective self-estimating data from the investigated medical provider sample was preferred against objective data. Hence, the results of the questionnaire are based on a self-assessment of the participating medical providers and allow a relative comparison of IDS networks. Similar studies showed that such an approach is feasible and methodically efficient to produce reliable results (e.g., Dess and Robinson 1984).

Within the existing literature, general indicators to measure the latent variables in the context of a German IDS have not yet been defined. For the present investigation new indicator scales had to be developed and are based on two types of sources: literature research and expert interviews. The corresponding literature provided indicators from former research that could be adapted to this new context. Several adjustments, i.e., additions and eliminations of items as well as

item redevelopments to define the items of a latent variable, were accomplished on the basis of theoretical considerations and various expert literatures. Additionally, expert interviews supplemented the theory-based item list. As interview partners I consulted health insurance companies, medical providers from different fields, health-care experienced management consultancies and a management company. All theory- and practice-based indicators were collected and categorised. Redundant indicators were eliminated. As a result, a collection of indicators for the present empirical investigation was generated. It is based both on applications of the theory and expert opinions and perceptions.

The measurement approach for each of the theoretical constructs in the model is described briefly. All final indicators of the latent variables appear in the Appendix. A seven-point Likert-type scale with the extreme values „strongly disagree“ and „strongly agree“ was used.

Information exchange

Information exchange refers to the degree of how often proprietary information is communicated to the partners. The items used in this study were based on scales developed by Heide and John 1992 ‘norm of information exchange’ and Nielson 1997 ‘information sharing’.

Coordination

Coordination refers to the partners engaging in combined decision making and problem solving. The items are based on items formulated by Nielson 1997 ‘joint working’.

Quality from the patients’ point of view

Four items refer to the evaluation on health care quality from the patient’s point of view. These items reflect estimations of the IDS health care quality and their assessment in comparison to offers from the competition. This scale was based on the Menon, Jaworski and Kohli 1997 ‘product quality’ scale.

Quality from the medical providers’ point of view

These items were developed based upon expert discussions and literature research. They measure the positive impact and effect of cooperation on the quality, e.g. complications and secondary disorders.

Detailed contract

The items of the detailed contract describe the level of detail that is used within the IDS contracts to determine roles, responsibilities and expected performance. The items are based on Wuyts and Geyskens 2005 ‘detailed contract drafting’.

IT-system and agreements about the information procurement

These scale items were developed based upon expert discussion and literature research. IT-system referred items show whether the partners are connected to the IT-system. The items of the construct ‘agreements about the information procurement’ measure the degree to which the IDS-partners document patient-specific information centrally. They also measure the intensity of communication before and after the referral of a patient.

Relational and cognitive social capital

The developed items are based on a paper written by Nahapiet and Ghoshal 1998. The scales measure the degree of involved soft factors such as partner identification, rising of consumer confidence and the degree of common language and knowledge within an IDS network.

Standardized linkage system

A standardized linkage system leads to a highly fixed and prescribed treatment path to combine the partners work. JB Heide and A Weiss's 1995 'formalization' scale was modified and expanded for this study.

Individualized instruments

This scale measures to which level the treatment is patient-individualized. The scale items were developed based upon expert discussion and literature research.

Active patient integration

These scale items were developed based upon the study of Nygaard and Dahlstrom 2002 'customer satisfaction' and as well as on expert discussion and literature research. In this IDS-context, the extent of the items 'information brochures of the IDS treatment program', 'assistance to integrate the patient in the treatment process' and 'trainings for the patients' self management' are measured.

Scope for opportunistic behaviour

This scale is based on the work of Wuyts and Geyskens 2005 'behavioural uncertainty'. The scale 'scope for opportunistic behaviour' measures the extent to which the partners are unable to assess their partners' behaviour and performance.

The present items were used to test the hypotheses.

6 Results and Discussion

The evaluation and analysis of the hypothesis is based upon the partial least square (PLS) method. The PLS is a structural equation model technique. PLS was used because it is more appropriate if the sample size is small and the model is complex than alternatives, such as LISREL (Fornell and Bookstein 1982). Due to the disuse of distributional assumptions within the PLS method traditional parametric tests of significance are not suitable.

The structure equation model consists of latent variables with reflective and formative relations. To evaluate the fit of the model it was necessary to make use of criteria that examine both reflective and formative latent variables (Fornell and Larcker 1981). The tables in the Appendix represent the estimation results.

The positive or negative path coefficients between the identified success factors and result factors were determined by the PLS procedure. The level of significance was determined by Bootstrapping. Both, the path coefficients and the level of significance decide about the confirmation or disconfirmation of the hypotheses. The result factors have been successively analysed to examine the correctness of the hypotheses.

The existence of significant positive effects between '*information exchange*' and the 'agreements about information procurement' ($\beta = 0.167$, $p < 0.01$), 'relational social capital' ($\beta = 0.380$, $p < 0.01$) and 'cognitive social capital' ($\beta = 0.331$, $p < 0.01$) support the hypotheses 3-5. 'Relational and cognitive social capital' has a higher impact on 'information exchange' than 'agreements about information procurement'. In summary, social capital promotes the compatibility of the medical providers' modules and generates a more intense information flow. The agreements about information procurement support and promote the information exchange in the same manner.

The explained variance of the construct 'information exchange' is 53%. Chin (1998) defines certainty measure of 0.67 as strong, of 0.33 as moderate and of 0.19 as weak. Therefore the value 53% is judged as moderate.

The hypothesis (a) is based on an interrelation assumption between 'information exchange' and 'coordination'. Due to a significant positive connection ($\beta = 0.360$, $p < 0.01$) this assumption can be confirmed. This leads to the conclusion that a high information exchange causes an increase of the partners' coordination within IDS. The affection of the variable 'active patient integration' on the '*coordination*' is also positive and even stronger ($\beta = 0.452$, $p < 0.01$). The significance of this connection is valid and judges the hypothesis 8 as correct. The active patient integration into the treatment process creates transparency within the health care value chain. Transparency, e.g., introduced by Blueprinting as an instrument of the Mass Customization, is feasible to potentially increase the partners' coordination in the entire health care value chain.

Furthermore, a significant connection between 'standardised linkage system' and 'coordination' can not be confirmed. Thus, the hypothesis 6 is to reject ($\beta = 0.037$, $p > 0.1$). One explanation could be that when a standardised linkage system is already implemented for the common treatments, further coordination to connect the medical provider is not required. The coordination for the common treatments has already taken place.

49.9% of the variance of the 'coordination' is explained by the identified factors. This value is classified as moderate.

A positive significant interrelation between the latent variables 'detailed contracts' and high '*quality from the patients' point of view*' exists, so that hypothesis 1 can be accepted ($\beta = 0.354$, $p < 0.01$). However, no significant connection between 'quality from the patients' point of view' and the variables 'IT-system', 'individualised instruments', 'coordination', 'scope for opportunistic behaviour' can be determined, so that the hypotheses 2a, 7b, b and e ($p > 0.1$) are to be rejected. It can be supposed that an evaluation of the quality from the patients' point of view by using objective criteria is constricted. This is caused by the information asymmetries to the account of the patients. Therefore patients judge the quality largely by using subjective criteria, as empathy of the medical providers, for example. In addition, the concept of the IDS is still in an early stage and the advantages of cooperation may not yet be visible and noticeable to the patients. However, it is important that the patients notice the utility of the IDS. The recognition of the approach itself is of minor relevance. „Customers do not

purchase customization per se; they purchase service value [...] however, if customization does not add value, customers will not pay for it" (Pine 1993).

Based on this model, the variance of the variable 'quality from the patients' point of view' can be explained to 22% by the identified factors, which is classified as weak. The construct 'quality from the patients' point of view' has got various further facets which can be: patients' feelings and emotions during the health care production, equipment of the hospital/doctor's office and qualifications of the medical providers. Whether and to which extent these components are considered, depends on the patient. In this study the focus is set on the influence on only one facet - the coordination in the IDS in accordance with the instruments of Mass Customization. Therefore, in this context the explained variance of the 'quality from the patients' point-of-view', with 22% can be valued as relatively high.

'IT-system' ($\beta = 0.162$, $p < 0.05$), 'coordination' ($\beta = 0.239$, $p < 0.01$), 'individualised instruments' ($\beta = 0.092$, $p < 0.1$), 'scope for opportunistic behaviour' ($\beta = -0.122$, $p < 0.1$), 'quality from the patients' point of view' ($\beta = 0.243$, $p < 0.01$) have a significant connection to the '**quality from the medical providers' point of view**'. Thus the hypotheses 2b, c, 7a, e, d can be confirmed. The largest impact on 'quality from the medical providers' point of view' is made by 'coordination' and 'quality from the patients' point of view'. 'Coordination' affected by 'information exchange' and 'active patient integration' increases the degree of coordination. Through an active patient integration the medical providers in the IDS can be informed about the needs of the patients. Again the patients' needs determine up to a certain point the selection and coordination of the medical providers.

27.7% of the variance of the 'quality from the medical providers' point of view' is explained by the shown constructs. This value is evaluated according to Chin (1998) as weak. The construct 'quality from the medical providers' point of view' consists, as the 'quality from the patients' point of view', of more facets than explained in the study. Therefore, by exploring only one facet of the construct 'quality from the medical providers' point of view' the value of 27.7% can be judged as acceptable. Further facets of this construct can be: the qualification and the experiences in their occupation as a medical provider. In addition, the healing process and state of health of the patient can have effects on the construct 'quality from the medical providers' point of view'. Changes of the state of health may be influenced by underlying biological procedures, e.g., mechanisms of the self-healing. Also, factors such as the restfulness of the patient can affect the 'quality from the medical providers' point of view'. Often these mentioned factors can neither be influenced by the medical providers nor can the influence on the healing process of a patient be measured.

The '**scope for opportunistic behaviour**' has a significant negative connection to the variables 'detailed contracts' ($\beta = -0.216$, $p < 0.01$), 'agreements about the information procurement' ($\beta = -0.124$, $p < 0.1$), 'relational social capital' ($\beta = -0.289$, $p < 0.01$), 'active patient integration' ($\beta = -0.172$, $p < 0.05$) and a 'standardised linkage system' ($\beta = -0.139$, $p < 0.05$). The hypotheses 9a, 9c, 9d, 9f and 9g can therefore be confirmed, because in this case a higher value of these

variables reduces the value of the 'scope for opportunistic behaviour'. The hypotheses 9e and 9h have to be rejected due to a lack of significant correlation between 'scope for opportunistic behaviour', 'cognitive social capital' and 'individualised instruments'. It can therefore be assumed that, regarding the extent of the 'scope for opportunistic behaviour', it does not matter whether partners speak a common language and have a common knowledge, or individualise the treatment by using quality circles or secondary opinions. Also, hypothesis 9b which postulates a negative connection between 'IT-system' and 'scope for opportunistic behaviour', is not confirmed, since a significant positive connection was uncovered here ($\beta = 0.122$, $p < 0.05$). This can be explained by the fact that many German medical providers are still very critical and sceptical to IT-systems as a new instrument in their jobs. Also the many discussions about data security in the context of using a common IT-system irritate the medical providers. This can lead to the assumption that from the medical providers' point of view IT-systems do not increase transparency, but rather may hide the behaviour of the medical providers.

44.8% of the variance of the 'scope for opportunistic behaviour' can be explained by the identified factors. This value is considered as average.

7 Conclusion

The IDS-network aims to eliminate the deficits of the exchange and cooperation in the traditional health care system in Germany. By eliminating them efficiently, the problems of coordination and motivation can be solved in the IDS. The design of the network has to enhance the coordination in the IDS while minimising the scope for opportunistic behaviour and creating a higher transparency of the partners' behaviour (motivation). This should lead to a maximisation of the productivity gains and facilitate the IDS to offer the patients a high-quality health care while keeping the costs on a low level. The patients, in the ideal case, receive a comprehensive coordinated treatment which is efficient under economic criteria and effective under medical aspects. Furthermore, in the future a competition of health care value chains will take place.

As a result of the theoretical and empirical analysis the following success factors have been identified by using the Mass Customization approach and *Porters'* support activities of his value chain:

The concentration on core competences, active assignments of responsibilities, competencies, requirements and an understandable objective in the IDS contract represent a requirement for an efficient *modularity* as defined by the Mass Customization. This affects the quality from the patients' point of view in a positive way. The medical provider can refer the patient to specialised medical providers corresponding to patients' specific needs. *Detailed IDS-contracts* raise the transparency of the partners work and contribute to the entire health care value chain. Inefficient and false referrals can be reduced.

Furthermore, the empirical results show that *compatibility* of the medical providers' treatments, seen as modules, yields in efficient information flow between the partners. Compatibility can be enabled by hard factors (*agreements about information procurement*) and soft factors (*relational and cognitive social capital*).

An adequate *standardised and individualised linkage system*, combining the compatible medical providers' modules, has to be implemented in accordance with the Mass Customization. Thus, the cooperation and connection of the medical providers' modules can be realised efficiently. *Active patient integration* into the common treatment process increases the coordination of the partners in the IDS, too. In total, a better connection and a higher coordination and therefore a reduction of isolated work raise the quality of the health care.

Finally, it was found out empirically that detailed contracts as hard factors and the relational dimensions of social capital as soft factors have the largest influence on reducing the *scope for opportunistic behaviour*. This leads to high transparency in the cooperation of IDS. To what extent a reduced opportunistic scope facilitates the motivation of the medical providers to enable a cooperative behaviour has to be examined in further analyses. However, the empirical results showed that a lower scope for opportunistic behaviour and therefore, a higher transparency lead significantly to a higher quality from the medical providers' and the patients' point of view.

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Appendix I: Reflective Items of the Structural Equation Model

item (reflective)	loading >0.7	DEV > 0.5	reliab- ility > 0.6	dis- crimi- nant validity
Construct: Information Exchange (IE) ($\alpha = 0.8$)				
We share of course information with the partners.	0.81			
Each partner voluntarily makes information available, if needed for the common treatment.	0.84	0.71	0.88	0.44
Each partner is, within limits, willing to provide confidential information to their partners.	0.88			
Construct: Coordination (C) ($\alpha = 0.86$)				
I am strongly integrated in the treatment process of my partners.	0.70			
We make all important treatment decisions together.	0.85			
We jointly decide on the objectives for the common treatment.	0.91	0.65	0.9	0.39
We mutually agree before making major decisions for the common treatment.	0.73			
We work out the common treatment as a joint effort.	0.80			
Construct: Quality from Patient Point of View (QP) ($\alpha = 0.9$)				
Our customers often praise our service quality.	0.85			
Our customers often praise our medical quality.	0.92			
Our quality is better than that of our competitors.	0.86	0.78	0.93	0.29
Our customers are firmly convinced that we offer very good quality.	0.9			
Construct: Quality from Medical Provider Point of View (QM) ($\alpha = 0.78$)				
With the IDS we reduce the secondary disorders.	0.78			
With the IDS we reduce the complications during the treatment.	0.8			
With the IDS we reduce the time spent for a complete treatment.	0.73	0.6	0.86	0.14
With the IDS we reduce the waiting period of the patients at a referral to a partner (medical provider).	0.78			

item (reflective)	loading >0.7	DEV > 0.5	reliability > 0.6	discriminant validity
Construct: Detailed Contract (DC) ($\alpha = 0.87$)				
Our contract precisely defines the responsibility of each partner.	0.91			
Our contract precisely defines the role of each partner.	0.83	0.71	0.91	0.23
Our contract precisely states how each party is to perform.	0.86			
Our goals and strategies of the IDS are comprehensibly formulated.	0.78			
Construct: IT-System (IT) ($\alpha = 0.89$)				
All partners are attached to the IT-system.	0.94			
We implemented a uniform IT-system in the IDS.	0.96	0.90	0.948	0.07
Construct: Relational Social Capital (RSC) ($\alpha = 0.52$)				
We speak a common language in our IDS which simplifies the information exchange.	0.78	0.67	0.81	0.46
I share my knowledge with my partners.	0.86			
Construct: Cognitive Social Capital (CSC) ($\alpha = 0.92$)				
My partners are competent.	0.89			
My partners have good intentions and interests regarding me.	0.80			
My partners are accessible.	0.9	0.72	0.94	0.46
My partners are reliable.	0.9			
I identify myself with our IDS.	0.73			
Mutual giving and taking exist in the IDS.	0.88			
Construct: Scope for opportunistic behaviour (SOB) ($\alpha = 0.84$)				
Evaluating the partners' performance is a highly subjective process.	0.78			
It is difficult to ascertain whether a good job is being done by the partners.	0.92	0.76	0.9	0.33
It is difficult to determine whether agreed-upon quality standards and specifications are adhered to.	0.91			

Appendix II: Formative Items of the Structural Equation Model

Item (formative)	VIF
Construct: Agreements about the Information Procurement (AI)	
The storage of information is centralised and accessible for everyone, if permitted by data security conditions.	1.03
I communicate with my partner before a referral of a patient.	1.04
I communicate with my partner after a referral of a patient.	1.07
Construct: Active Patient Integration (PI)	
We provide our patients information brochures about our treatment program.	1.82
We provide quality assistance to integrate the patient in the treatment.	1.86
We train the patients to the self-management.	1.17
Construct: standardised linkage system (SLS)	
Within the IDS I can specialise more strongly in my work area.	1.06
We work with guidelines.	1.21
The treatment is handled to a large extent by standard procedures (prescribed process cycles in treatment paths).	1.21
Construct: individualised instruments (II)	
We work with quality circles.	1.09
Catching up of secondary opinions is self-evident in our IDS.	1.09

For all items I used seven-point Likert-type scale with the extreme values “strongly disagree” (1) and “strongly agree” (7).

Appendix III: Correlation Matrix of Study Measures

	RSC	CSC	IT	II	SOB	DC	SLS	IE	QP	C	PI	QM
RSC												
CSC	0,6779											
IT	0,075	0,123										
II	0,367	0,407	0,256									
SOB	-0,577	-0,463	-0,021	-0,325								
DC	0,478	0,38	0,151	0,335	-0,463							
SLS	0,382	0,373	0,159	0,539	-0,386	0,337						
IE	0,662	0,64	0,067	0,387	-0,469	0,373	0,303					
QP	0,502	0,537	0,042	0,226	-0,322	0,436	0,283	0,504				
C	0,478	0,424	-0,051	0,334	-0,424	0,232	0,279	0,575	0,239			
PI	0,443	0,428	0,089	0,395	-0,445	0,235	0,295	0,452	0,213	0,625		
QM	0,331	0,311	0,186	0,308	-0,335	0,348	0,28	0,348	0,366	0,371	0,218	
AI	0,345	0,31	0,438	0,405	-0,346	0,273	0,265	0,401	0,201	0,307	0,453	0,246