Co-Constructive Information Systems

An Alternative for Customer-oriented Organizations

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Abstract

This paper examines practical applications of the concept of the co-constructive system. Co-constructive information systems have been discussed in Forsgren (1988). They are characterized by the information system creating the socially creative unit of activity together with the actors. The activity has the capacity therefore to react to itself and its surroundings, and is totally dedicated on customer satisfaction. The main purpose of the paper is to illustrate the practical applications of co-constructive ideas in the development of information systems, and to highlight their implications. From a longer-term perspective the paper aims to support organizations which, in their efforts toward more customer-oriented activities, set out to apply the principle of co-constructive systems in information systems development. One conclusion is that co-constructive information systems represent a clear alternative for customer-oriented organizations. In this way organizations can capture information requirements, and transform these into knowledge that can be passed back to the customer.

Keywords: Sensor, Processor, Distributor, Activity Information Volume, Presenter

BRT Keywords: HA, HC, UF

Introduction

At the end of 1980 an abolition of the National Pharmacy's monopoly of pharmaceutical retail business in Sweden was discussed. The National Pharmacy identified information- and knowledge- management as a successful strategy in a competitive situation. The main question that arose was concerned how the National Pharmacy would be able to supply updated and systematized information to their customers (Albinsson, 1998; Bergstedt, 1998). In co-operation with Unusual Systems, the National Pharmacy initiated a systems development project, Knowledge Support in the Customer Contact, which had a theoretical basis in the work of Forsgren (1988).

Forsgren (1988) discussed how change and data quality problems[1] could be handled through a continuous consideration of clients' interests. Clients' interests, and in

[1] Occurs when data and rules that make up the core of an information system degenerate (Forsgren, 1988).

particular the fact that those interests are constantly changing, create the change pressure on activity and information systems. This changeableness is because the activity is obliged to try to satisfy different clients' interests, and simultaneously, depending on the individual client's interest change, over time.

Forsgren (1988) wrote that co-constructive information systems are characterized by the information system creating the socially creative unit of activity together with the actors. The activity has the capacity therefore to react to itself, and its surroundings and is totally dedicated to client satisfaction. With this as a starting point Forsgren (1988) developed a co-constructive synthesis, which aims to encourage and instruct clients in the work of reconstructing information systems. The purpose is to create ideal-oriented information quality[2], and with that to be able to handle change and data quality problems (Forsgren, 1988; Forsgren et. al, 1994).

The project, Constructive Systems Development, was initiated at the Department of Informatics at Umeå University in 1991. Forsgren's (1988) ideas were developed in the project, and one of the case studies was concerned with the National Pharmacy's information system, Knowledge Support in the Customer Contact. The project group established co-operative relationship with both the National Pharmacy and Unusual Systems, and plans for the information system, called The Archive, were developed. The basic idea of The Archive was for a continually developing living information system, through which the National Pharmacy could support the notion of better customer service and information provision. The Archive is built on the idea that through the customer-oriented and quality-driven learning organization in which the staff is continuously trained and their competence increased, the customers receive better information (Albinsson, 1998; Forsgren et. al, 1994). In 1993 a limited test-run of The Archive was initiated. In the same year the project Constructive Systems Development was concluded, since which time there has been no follow up on The Archive (Forsgren et. al, 1994).

The present paper sets out from where the Constructive Systems Development project ended. Work for the paper rests on Eriksson's (1994) assumption that the co-constructive systems idea, with an expressed customer orientation, will become increasingly important in the future in that increasing numbers of organizations will strive toward more customer-oriented activities. This means there is great value in studying The Archive information system, and thus generating enhanced understanding for the practical applications of the concept of co-constructive systems.

The main purpose of the paper is to illustrate practical applications of co-constructive ideas in the development of information systems, and to highlight their implications. From a longer-term perspective the paper aims to support organizations which, in their efforts toward more customer-oriented activities, set out to apply the co-constructive systems principle in information systems development. The work is limited to studying The Archive through the model for co-constructive information systems, which is introduced in the section *Model for co-constructive information systems*.

To attain the aim of the paper, research was undertaken through a combined literature study and case study (Patton, 1990; Yin, 1994). Material for the case study came from an investigation by the authors at the National Pharmacy head office, The Pharmacists C W Scheele and Unusual Systems. Written documentation together with the interviews are the most important sources of data. The semi-structured interviews lasted (Kvale, 1997; Patton, 1990; Yin, 1994) for between 45 minutes and one hour. Data

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[2] Information that is expressed in relation to ideals of different groups of clients who are served by the information system (Forsgren et. al, 1994).

collection focused on the model for co-constructive information systems.

The paper is structured as follows; Initially co-constructive theories are introduced. These are then specified in a model for co-constructive information systems. The next step is a presentation of the National Pharmacy case to illustrate an organization where co-constructive ideas are practiced. In the following The Archive is analyzed through the model for co-constructive information systems, to highlight the implications of co-constructive ideas in practical applications. After that a summary of these implications is presented. The aim of this summary is to support organizations which, in their efforts toward more customer-oriented activities, set out to apply the co-constructive systems principle in information systems development. Finally a presentation of conclusions concerns practical applications of co-constructive ideas in information systems development within organizations.

Co-constructive information systems

In this chapter co-constructive theories are introduced. In the chapter's final section these theories are specified in a model for co-constructive information systems.

A social constructive view of knowledge

Co-constructive information systems are built on a social constructive view of knowledge, which Forsgren (1988) designated as co-constructive. The fundamental premise in the constructive view is that facts are related to measuring systems created by man. A constructive view of knowledge is influenced by American pragmatism, and today is represented by researchers such as C. W. Churchman (1971, 1973, 1979), R. Ackoff (1981) and P. Checkland (1981). Other researchers who have thought about this view of knowledge, and what it means in varying contexts are R. Rorty (Rorty, 1980) and P. Berger & T. Luckman (1967).

E. A. Singer's philosophy of measurement

A social constructive view of knowledge is built on E. A. Singer's (1959) philosophy of measurement[3], which was inspired by Kant. In this philosophy the facts can always be related to those who are served by the measurement, namely the clients. C. W. Churchman (1971, 1973, 1979) and others have developed this philosophy of measurement into a systems approach (Forsgren, 1988).

C. W. Churchman's social systems approach

C. W. Churchman's social systems approach describes how measurement and output from measurement is related to the clients' different ideals. It is in the struggle among different clients' ideals that new ways of measuring and new facts are constantly reconstructed (Churchman, 1979; Forsgren, 1988).

With C. W. Churchman's social systems approach as a starting point, Forsgren (1988) developed his co-constructive perspective on information systems.

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[3] Deals with the activity of creating accurate, correct and general information (Singer, 1959).

Co-constructive perspective on information systems

Forsgren's co-constructive perspective on information systems can be described with the following concept consisting of seven key elements; In an *Activity* that is lead by *Leaders*, the *Actors* and *Information system* serve *Clients*. The *Designer* makes suggestions as to how an activity should work while the *Philosopher* makes suggestions as to how an the designer should interact within an activity (Forsgren, 1988:176).

Forsgren (1988) writes that co-constructive information systems are characterized by the information system creating the socially creative unit of activity together with the actors. The activity has the capacity therefore to react to itself and its surroundings, and is totally dedicated to client satisfaction.

Forsgren (1988) uses the transformation process as a synonym for the concept of activity. In the transformation process the clients' questions and demands are transformed into measurement and output from measurements. Such results may also be in the form of different types of actions taken in order to serve the client. Accordingly, the transformation process constitutes the whole activity that transforms the clients' demands into relevant actions.

Forsgren's (1988) co-constructive perspective on information systems can be summarized as a client-oriented theory for design of information systems, which are resistant to change and data quality problems. In 1991 the Constructive Systems Development project was initiated, and within it Forsgren's ideas were developed further.

The Constructive Systems Development project

The project's basic idea is that clients' information requirements constitute the basis for a service activity, where the clients questions are considered as indicators of the social situation that the activity must handle in order to serve its purpose. The project's basic idea can be summarized by the concepts of ideal oriented information quality, co-constructive design and information systems as co-constructive social actors.

Ideal-oriented information quality represents information that is expressed in relation to the ideals of different groups of clients who are served by the information system. The concept of ideal-oriented information quality is primarily related to two groups of clients. One group is those who are directly served by the information, for example the pharmacy customer who visits a pharmacy. The other group consists of those who serves others by virtue of information quality, for example pharmacy staff (Forsgren et. al, 1994).

Co-constructive design designates the work of identifying and proposing new ideals, as well as finding solutions for how those ideals can be implemented in an activity. The dynamic change of ideals, which develops at the same time includes varying groups of clients, and creates the need for a well thought-out plan of revision. Thus, maintaining a high information quality demands, for example that the National Pharmacy continuously supervises total information quality. A double process of revision that partly examines quality, and partly examines the realization of the examining of quality can realize that (Forsgren et. al, 1994).

Information systems as co-constructive social actors influence the space of possible actions for the other actors within the activity, as well as those served by the activity. Information systems as social actors perform two types of actions. The first type aims at serving the ideals that the leaders have stipulated. That could, for example, be realized through The Archive collecting and presenting information in different ways,

depending on what ideal is to be served. The second type of actions aims at supporting and stimulating a constantly ongoing reconstruction of the ideals, which should be served by the activity. That could, for example, be realized through The Archive supporting a continuous search for information that serves the clients requirements more effectively (Forsgren et. al, 1994).

Model for co-constructive information systems

In this section the co-constructive theories presented in Forsgren (1988) and Forsgren et. al (1994) are specified in a model for co-constructive information systems.

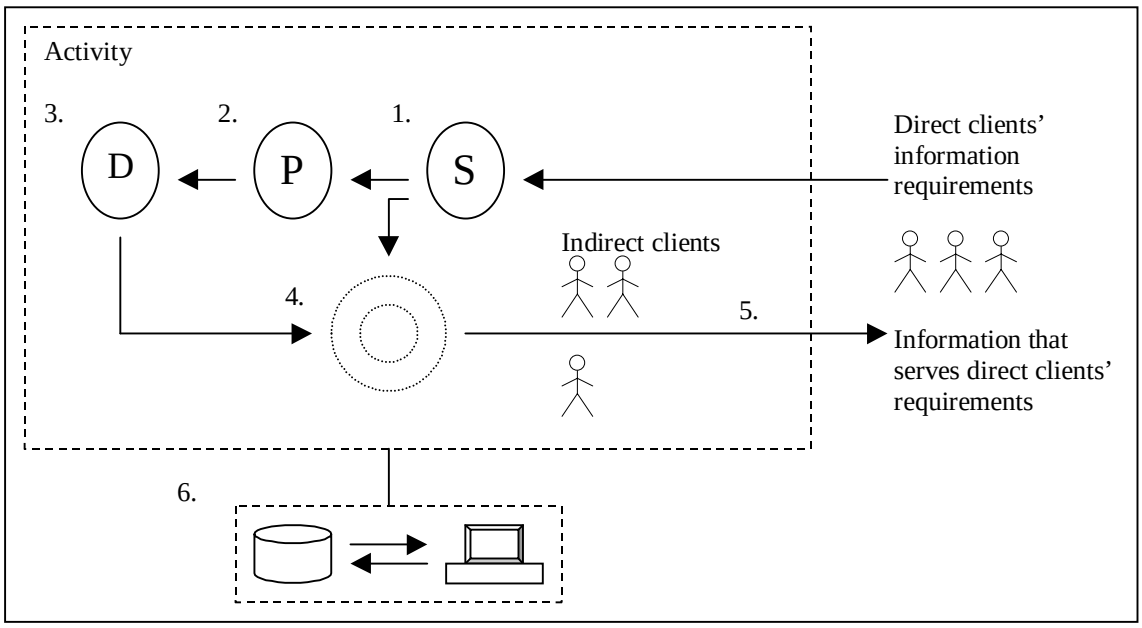

Figure 1: Model for co-constructive information systems.

The model for co-constructive information systems consists of; A *sensor* (1) that surveys and scans the market in order to detect deficiencies as well as inaccuracies in the *activity's information volume* (4). The second component is a *processor* (2) that partly updates existing information and partly creates new. Third is a *distributor* (3) that handles the distribution of information within the activity. Next is a *presenter* (5) whose task is to manage referral back of information to the direct clients, whose information requirements the activity aims to satisfy. The referral back can be done through indirect clients, by way of the information system or through a combination of both of these. The final component is an *information system* (6) that supports point 1-5.

The introduced model for co-constructive information systems is used for analyzing The Archive, which is presented in the chapter *The Archive analyzed through the model*.

Case Study: The National Pharmacy

In this chapter the National Pharmacy case is presented in order to illustrate an organization where co-constructive ideas are practiced.

According to a federal agreement the National Pharmacy has an exclusive privilege to trade pharmaceutical preparations in Sweden. The National Pharmacy has

11000 employees. The company consists of 904 pharmacies divided into 23 regional sections and a Head Office. The Head Office has several sections and each section has a special function. The section Farmaci/ Marknad has 60 employees, and is responsible for the pharmaceutical information service. This information is handled by a special unit, consisting of 11 pharmacists, known as the Pharmaceutical Information Center (ALI) (Holtin, 1998; Malm, 1998; Nilsson, 1998).

The Pharmaceutical Information Center (ALI)

ALI's task is to offer correct and relevant pharmaceutical information to pharmacies and customers. Questions about pharmaceutical preparations should be answered quickly in such a way that the customer can understand and use the information. ALI should also provide all the pharmacies with reliable and current information (Lundberg, 1998; Nilsson, 1998).

ALI has a special on-duty service "ALI-Jouren" where doctors, pharmacy staff and private persons can get information. This service is situated at the Pharmacy C W Scheele in Stockholm. The staff members at "ALI-Jouren" have access to the different pharmaceutical preparations and have experience of a big pharmacy. The also have access to the knowledge base of ALI, which is stored in databases, different archives and literature. ALI has access to the library at the Head Office, which consists of more than 2000 titles and 200 scientific papers in pharmacy and pharmaceutical information. On a regular basis ALI uses a number of databases, above all the National Pharmacy's internal database The Archive and Medline, Drugline, Swemed and Swedis. Furthermore the Internet has become an increasingly utilized source for information concerning new pharmaceutical preparations. ALI also makes use of various CD- and microfiche systems in order to search for books and articles, and TV, radio and newspapers to search for medical news. ALI uses the knowledge acquired in order to answer questions mainly from pharmacy staff, but also from customers and doctors. Before questions and answers are stored in The Archive's questions and answers database, a committee of investigation, "Sittronden", will ensure their quality (Varjehanda, 1998).

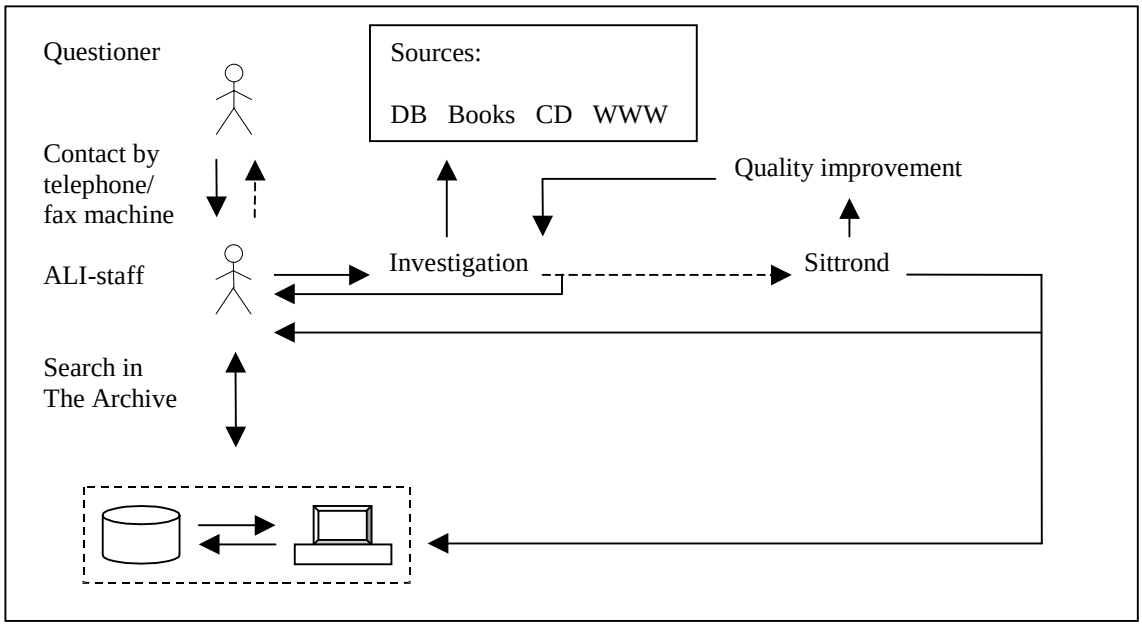

Figure 2: Model for ALI's activity of handling questions and answers.

ALI's activity of handling questions and answers consists of a number of steps; The ALI-staff receives questions by telephone or fax machine, and they will search The Archive for an answer. If there is an answer it will be sent directly to the questioner. If there is no answer ALI will start an investigation, and all sources of information will be used. Answers that belong to questions considered as non-recurrent are sent back to the questioner by telephone or fax machine. If ALI expects that a question may be sent to them several times, "Sittronden" will handle the answer to that question. Thus the staff of ALI examines whether the question is the real question, if the answer covers the question, and if the question can be broadened in order to create an answer that covers the interests of more clients. Questions and answers handled by "Sittronden" are stored in The Archive's questions and answers database as new information, and are at the same time passed back to the questioner (Bergstedt, 1998; Lundberg, 1998; Nilsson; 1998).

The Archive Information System

Besides ALI's questions and answers database The Archive exists of additional information sources in the form of other databases, documents and books.

In order to support the handling of those information sources The Archive is constructed on Microsoft SQL Server. The information can be inserted into The Archive in different ways. Word documents are stored directly from word; databases are updated either through programs developed using the 4GL tool Omnis or Internet Explorer. In SQL Server the documents are indexed in to make full text search possible. News updates are performed regularly so that users will be able to identify new as well as updated documents. Further, a function has been implemented in SQL Server that makes it possible for the users to guard words in the database (Pettersson, 1998). Microsoft Internet Information Server is used for the presentation of the information on the National Pharmacy's intranet. This information can be read by means of Internet Explorer. Since there are pharmacies without access to the intranet all information in The Archive, except the questions and answers database, is published on CD-ROM ("CD-Apotek"), which is distributed to every pharmacy in Sweden once a month (Pettersson, 1998).

The Archive analyzed through the model

In this chapter The Archive is analyzed through the model for co-constructive information systems, in order to highlight implications of co-constructive ideas in practical application.

Sensor

According to the model for co-constructive information systems the sensor's task is to survey and scan the market to detect deficiencies as well as inaccuracies in the activity's information volume.

Within the National Pharmacy, the collection of pharmacy customers' information requirements is accomplished through the customers telephoning ALI's on-duty service "ALI-Jouren" or contacting ALI through the pharmacy's staff. In that way the National Pharmacy has developed a sensor, which through contact with pharmacy customers scans the market's information requirements. In the National Pharmacy's case it is often concerned with sensitive personal information, and then an interaction between pharmacy

customer and information system is not a satisfactory solution since the real question may be concealed. The most important task is establishing the pharmacy customers' real information requirements.

The National Pharmacy designates particular years to be devoted to a specific information topic ("Informationstemaår"), which can be regarded as a measure for increasing the sensor's efficiency in surveying and scanning the market's information requirements:

> "The basic idea of "Informationstemaår" has been to provide information material that increases the customers' knowledge so that they know what to ask about… the pharmacy staff knows much and then it's about putting the right questions… so they can explain." (Olsson, 1998)

Consequently the National Pharmacy strives to provide information to their customers so they can ask better questions, and thus satisfy their information requirements.

However, in the present situation with economy measures, new demands and routines have resulted in increased lines at the pharmacies. That makes it impossible for pharmacy staff to take the time to discuss a question with a pharmacy customer:

> "We have no time… to spend together with the customer at the counter. I came from the pharmacy this morning, there it was 45 minutes waiting time for getting one's medicine. Then you can't sit five minutes at the counter and speaking about medicines. Those who are waiting get angry and start to scream because they can't get through." (Wennberg, 1998)

The effect of "Informationstemaår" with regards to the sensor's activity can't be established during existing circumstances. If pharmacy customers don't have the opportunity to put questions to pharmacy staff neither deficiency nor inaccuracy in the National Pharmacy's information volume can be detected, which implies that the sensor is not working.

Processor

According to the model for co-constructive information systems the processor's task is partly to update existing information and partly create new information.

Information can be updated in two separate ways. Firstly, as new information is received the information volume is concurrently updated. Secondly, the information volume is updated when information that is out of date is detected in response to demand. ALI applies the latter method, which accordingly means that The Archive's questions and answers database is updated when out-of-date information is identified in connection with a question submitted. In view of the fact that new pharmaceutical information is continually produced ALI's solution appears reasonable.

The creation of information is about satisfying identified as well as future information requirements. Information can be stored either as a unique answer for every specific information requirement, or broadened to apply more questions. From the pharmacy customers' point of view, that results in the stored answer not being considered of high quality. On the other hand, with customer contact the answer can be transformed to information of high quality if those parts of the answer that satisfy the pharmacy customer's requirements are selected.

In order to ensure that the answer covers different pharmacy customers' ideals it is reviewed by a committee of investigation ("Sittronden"), where pharmacists examine whether the answer satisfies identified or future information requirements. The work of

reviewing questions and answers results in a spreading of knowledge within ALI, since the pharmacists are specialized in different areas:

> "Those meetings we have… with the questions… becomes an education for ourselves." (Nilsson, 1998)

This could be considered as a form of in-service training that reinforces the National Pharmacy's competence in a specific area, and consequently ALI's activity appears to be valuable where customers' interests steer the production of information.

Before the test run of The Archive was initiated in 1993 ALI undertook work similar to today's, where questions and answers were stored in a card index. When The Archive came into use the manual card index was abandoned, and the information was stored in the information system. However, the changeover has been problematic. One reason is that the staff of ALI could no longer control the dissemination of information:

> "The gathering of information… in combination with the intention of making the information public through this medium involved that many… became doubtful… some are still uncertain… because of the fact that you are publicly exposed. Suddenly everybody can have a look at one's information… and you don't have the opportunity to perform the functions of a filter between the questioner and the information stored in the database." (Pettersson, 1998).

In the present situation "ALI-Jouren" answers about 35-50 questions a day, and The Archive's questions and answers database supports their work.

Within the National Pharmacy the questions and answers database is distributed solely through the intranet to the Head Office, the Pharmacy C W Scheele and the Pharmacy hospital, Huddinge. Consequently the questions and answers database is not available for the other 900 pharmacies, as it is not included in "CD-Apotek":

> "The reason they don't have… these questions and answers available is… we have high demands and we write for own use. And then, maybe we would have to write differently if the pharmacies are to get it." (Nilsson, 1998)

Thus the composition of "Sittronden", 11 pharmacists from the section Farmaci/ Marknad, is not satisfactory. Due to the fact that the pharmacy staff receives the majority of the pharmacy customers' questions, the questions and answers database should be available at the pharmacies. If the pharmacy staff were able to answer the pharmacy customers' questions, the customers' information requirements would primarily be satisfied. Information quality for the pharmacy customer can hardly be realized if the pharmacy staff don't experience the information as useful and of good quality.

Distributor

According to the model for co-constructive information systems the distributor's task is to distribute the information within the activity.

Within the National Pharmacy the information is distributed through the intranet and "CD-Apotek". The problem with the distribution is that the intranet is available only at the National Pharmacy Head Office, the Pharmacy C W Scheele and the Pharmacy Hospital, Huddinge. The other 900 pharmacies receive the information once a month through "CD-Apotek", which is a reduced version of The Archive. In consequence a limited part of the organization has access to current information through the information system. Since the customer contacts are handled by pharmacies all over the country they should have the information within reach on the intranet.

Activity Information Volume

The dynamic change of customers' information requirements creates the need for an information volume, which can be changed.

The National Pharmacy has put the activity's information sources together and indexed the content in order to make a full text search possible, and thus to survey the information volume:

> "One ideal that we have applied, is that of a uniform access to all information in one place… in order to avoid the necessity of looking in different systems. You shouldn't have to check different places because of different technical environments." (Albinsson, 1998)

The Archive is designed as a central platform that handles changes as part of its own activity, and partly in the information content, without any requirement that it change itself.

In order to increase the value of The Archive and ensure it's survival, the information is stored in a format that makes it usable through different interfaces. Internally, the information is stored as a number of medium-independent format, indexed databases.

Presenter

According to the model for co-constructive information systems the presenter's task is to manage the coupling back of information to the direct clients, whose information requirements the activity aims to satisfy. The coupling back can be done through indirect clients, by way of the information system or through a combination of both of these.

Ideal-oriented information quality is reached when the activity's customer's specific information requirements are satisfied. That can be realized through categorizing the customers, and designing the information in relation to each category. When presenting the information the customer is placed in a category. Information belonging to that category is then displayed. One alternative is to identify the customer's information requirements, and from a given information volume to choose parts that satisfy the latter's wishes. The difference between these two procedures is that in activities where it is possible to categorize the customers the presentation can be done through an information system. The customer specifies a category, and then receives the information appropriate to that category.

To present information to pharmacy customers through an information system may be complicated, since they could have several different questions. The pharmacy customer may wish to have information concerning a medicine's side effects, and as well as how different medicines affect each other. Since there are medicines with a similar composition the pharmacy customer has to specify a large numbers of parameters, so that the information system is able to present an information volume that the latter can assimilate.

ALI's procedure is that a pharmacist in dialogue with a pharmacy customer, first identifies that person's information requirements, and then chooses those parts of the information volume that corresponds to the requirements.

Experiences from the research work

In the previous chapter *The Archive analyzed through the model* implications of co-constructive ideas in practical applications are illustrated. Here a summary of these implications is presented, which aims to support organizations that, in their efforts toward more customer-oriented activities, set out to apply the co-constructive systems principle in information systems development.

An organization's sensor can consist of an information system, the activity's staff, or a combination. In the National Pharmacy's case with regard to the nature of the information, there is a need for the pharmacy customer to develop the question in a dialogue with the pharmacy staff. In organizations where the content of questions is of a more elementary nature, an information system can function as a sensor. Independent of the solution, it is important to create opportunities for the sensor to survey and scan the market's requirements in an effective way. Conceivable measures to achieve that goal could be to educate the customers so they can ask better questions, and to create an environment that makes the collection of information possible.

The processor's first task is to update the activity's information volume. How the information is updated should be related to the rate of change of the surroundings, and the activity's own ambition to satisfy the customers' information requirements. If there are few changes it may be possible to update on a regular basis. However, if the information's rate of change is higher and at the same time there is uncertainty as to whether the information will serve any customer, it is reasonable that the information be updated in relation to demands.

The processor's second task is to create the organization's information. That involves that the processor must be elaborated with the information's usefulness as a basis. The National Pharmacy case highlights the problems of separating production and use of information. ALI's "Sittrond" consists exclusively of pharmacists who belong to ALI, and as a consequence the information in The Archive's questions and answers database is documented in such a way that it cannot be distributed through the activity of the National Pharmacy. In organizations where there is not the same risk of the information becoming useless due to a technical language that is difficult to understand, perhaps it is not as urgent to consider the composition of the processor. All in all, what is needed is that the organization's information must be written for those who serve as well as those served, irrespective of whether they are direct or indirect clients.

Further the National Pharmacy case shows that the work of "Sittronden", where pharmacists' review questions and answers, results in a spreading of knowledge within ALI since the pharmacists are specialized in different areas. This could be considered as a form of in-service training that reinforces the National Pharmacy's competence in a particular area. Thus, for other organizations there would be value in an activity similar to ALI's, where customers' interest guide the production of information. However, it can be complicated to initiate a reviewing activity of the same sort as ALI's. At the beginning when ALI's information was published in The Archive's questions and answers database some pharmacists were doubtful. The fact that the information was made public led to an unusual situation for those pharmacists, in that the creator could not control the information.

Within the activity the distribution of the organization's information should be designed in relation to the information volume, the information type, and the information's tendency to change. However, the essential factor concerning the distribution is that the information must be accessible to the organization's customer

contacts.

How the activity's information volume should be handled depends on the organization's structure, the geographic distribution, and the type of information and so on. It is of great importance that, independent of the information's physical location, the organization's staff members in the customer situation have access to, and are able to find the information they need.

Like the sensor, the presenter can consist of an information system, the activity's staff, or a combination. Which solution is chosen depends on whether it is possible to categorize the organization's customers. The research work illustrates that in the National Pharmacy's case it is hard to categorize the pharmacy customers. In organizations where it is possible to categorize the customers, and design the information in relation to each category, an information system could be an acceptable solution. The customer specifies a category, and then receives the appropriate information through the information system.

Conclusions

The basic idea for The Archive was to create a continually developing living information system through which the National Pharmacy supported the notion of better customer service and information.

The research work demonstrates that the National Pharmacy generates possibilities for the realization of the Archive project. If the Archive is analyzed through the model for co-constructive information systems the essential components are present. There is a sensor, a processor, a distributor, a presenter, and an information volume that can be surveyed and reconstructed. However, because of the composition of the processor, ALI solely distributes the created information to the pharmacies by telephone.

Despite the problems of distributing the information within the organization, the National Pharmacy case illustrates that it is possible to apply the idea of co-constructive systems in the development of information systems. That is further elucidated if ALI is itself considered to be an organization. ALI has a sensor, a processor, a distributor, and a presenter, and the information volume of The Archive supports ALI's co-constructive activities.

By changing the composition of "Sittronden" the National Pharmacy increases the usefulness of the processor's work. This means that the created information can be distributed within the organization through the information system. That results, in turn, in that the National Pharmacy's intentions concerning The Archive can be realized. Expressed differently, the National Pharmacy is able to create, update, distribute, and present information in relation to the requirements of its customers.

In conclusion, co-constructive ideas are about a dynamic process that encompasses a number of interested parties. The research work displays that it is suitable for customer-oriented organizations to apply these ideas in the development of information systems. For organizations that aim to meet and satisfy the information requirements of their customers co-constructive information systems represent a clear alternative. In this way organizations can catch information requirements, and transform these into knowledge that can be passed back to the customer.

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