DOCTORAL CONSORTIUM

DESIGNING A PROCESS MODEL OF INTEGRATED LIFELONG PROVISION OF HEALTHCARE TO PATIENTS

ŽIVA RANT, TOMAŽ KERN
University of Maribor, Faculty of Organizational Sciences, Kranj, Slovenia
ziva.rant@student.um.si, tomaz.kern@um.si

During a period of treatment, patients come into contact with a variety of health providers at different levels of the health system. Gaps can form between individual treatments. Judging from experiences in other sectors, such as industry, viewing patient care as a process could be one of the factors in a successful solution. The basic research method will be the Design Science Research approach. The research will explore the intersection of business processes, healthcare provision and digital transformation. The result will be an artefact - a conceptual organizational process model of the lifelong integration of patient care. We would like to demonstrate that understanding healthcare provision as a lifelong organisational process has a significant positive effect on reducing organisational and information gaps between different instances of treatment.

Keywords: healthcare provision, business process, organisational process, organisational gap, information gap

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1 Introduction

Healthcare is in crisis. On the one hand, we have an ageing population (Prebivalstvo - Slovenske regije in občine v številkah, 2023), which also means an increase in the number of patients needing healthcare. This requires an increasing number of medical treatments. While new treatment methods and new drugs help people live longer and enjoy better treatment outcomes, they also require ever greater financial investment. On the other hand, we are faced with limited resources: human (shortage of doctors and other healthcare workers), spatial and financial (Strategija razvoja zdravstvene dejavnosti na primarni ravni zdravstvenega varstva do leta 2031, 2024). We cannot influence demand or the limitations in any meaningful way. We therefore need to find greater efficiency within the health system.

Our previous research (Rant, 2001) and other sources (Dumas et al., 2018; Hammer, 2015; Hammer & Champy, 1995, 2003; Keen, 1997; Keen & Knapp, 1995; Kern, 2022; Vila, 1994, 2000; Vila & Kovač, 2006) show that the organisational and information gaps that form between consecutive activities in traditional functional organisations could be reduced or even eliminated by a process-based form of organisation. We note a similar situation, and thus an opportunity, in healthcare.

2 Problem definition

During a period of treatment, patients come into contact with a variety of health providers at different levels of the health system.

Over the course of their lifetime, a patient can receive treatment from the following:

- at the primary level: general practitioner, family doctor or paediatrician, dentist, gynaecologist, physiotherapist, home nursing service,
- at the secondary level: specialists in specialist clinics and hospitals (a patient may also move between hospital departments), health resorts,
- at the tertiary level: the University Medical Centre (UKC) (where the patient may move between clinics and departments),

and in these contexts: home help, day centres for the elderly, care homes, hospices.

Organisational gaps and information gaps (hereinafter: gaps) can form between individual treatments.[1]

On the basis of the reviewed literature, we will focus on the following problems in our research:

P1 Organisational and informational gaps occur between treatments with different healthcare providers. (Amelung et al., 2021; Bürkle et al., 2017).

P2 Attending health professionals are not always apprised of the activities and results of previous treatments (Amelung et al., 2021, p. 11; Bürkle et al., 2017).

P3 Attending health professionals are not always apprised of the drugs that have been prescribed in the course of previous treatments or the drugs that the patient is currently taking. (Bürkle et al., 2017; Žerovnik et al., 2018).

P4 The fragmented nature of healthcare promotes duplication and the inefficient use of resources, which leads to gaps in care for patients with multimorbidities and reduces the general capacity of the health sector, since it forces the best health professionals to focus on specific conditions (WHO Global Strategy on People-Centred and Integrated Health Services Interim Report, 2015).

2.1 Thesis

Understanding healthcare provision as a lifelong organisational process has a significant positive effect on reducing organisational and information gaps between different instances of treatment.

2.2 Expected results

The main result of the research will be an artefact: Conceptual organisational process model of integrated lifelong provision of healthcare to patients.

[1] In our research we understand gaps as organisational and information gaps.

In constructing this artefact, we asked the following research questions (RQs):

RQ 1 Do organisational and information gaps occur between treatments with different providers?

RQ 2 How do organisational and information gaps between treatments influence the effectiveness of patient care?

RQ 3 How do organisational and information gaps between treatments influence the quality of patient care?

RQ 4 How does process organisation influence (organisational and information) gaps between treatments?

The doctoral thesis will explore the intersection of business processes, healthcare provision and digital transformation (Fig. 1).

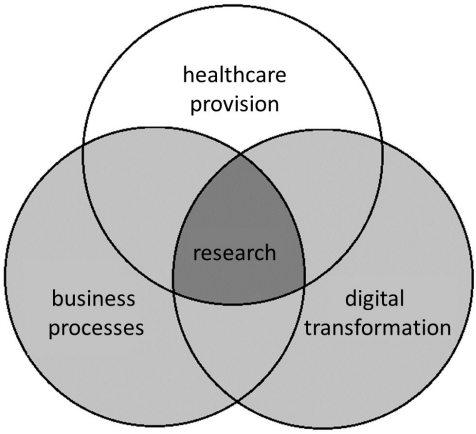

Figure 1: The intersection of business processes, healthcare provision and digital transformation
Source: Own

The thesis's original contribution to science is represented by a new comprehensive conceptual organisational process model of integrated lifelong provision of healthcare to patients, which represents an innovation in the field of organisational sciences and, at the same time, contributes to in-depth understanding of lifelong

healthcare provision. The expected original scientific contribution made by the thesis will be proof that changing our view of lifelong healthcare provision, as a process, has a significant positive effect on reducing or eliminating organisational and information gaps between different instances of treatment and, consequently, improves the effectiveness and quality of treatment, and thus of the health system.

3 Methodology

The basic research method will be the design science research methodology (DSRM) or design science research (DSR) (Hevner et al., 2004; Hevner, 2007, 2022; Kljajić Borštnar, 2022; Kuechler & Vaishnavi, 2008; Peffers et al., 2007, 2007; vom Brocke et al., 2020a, 2020a).

The result of the doctoral thesis will be an artefact – a conceptual organisational process model of lifelong integrated healthcare provision for patients.

On the basis of the finding of the theoretical sources cited, we will follow the design science research process model, adapted from (Kljajić Borštnar, 2022; Kuechler & Vaishnavi, 2008; Peffers et al., 2007; vom Brocke et al., 2020a), Fig. 2.

The planning and development research process consists of the following phases:

- identification of the problem and motivation,
- definition of objectives and proposed solution,
- design and development,
- demonstration,
- evaluation,
- communication.

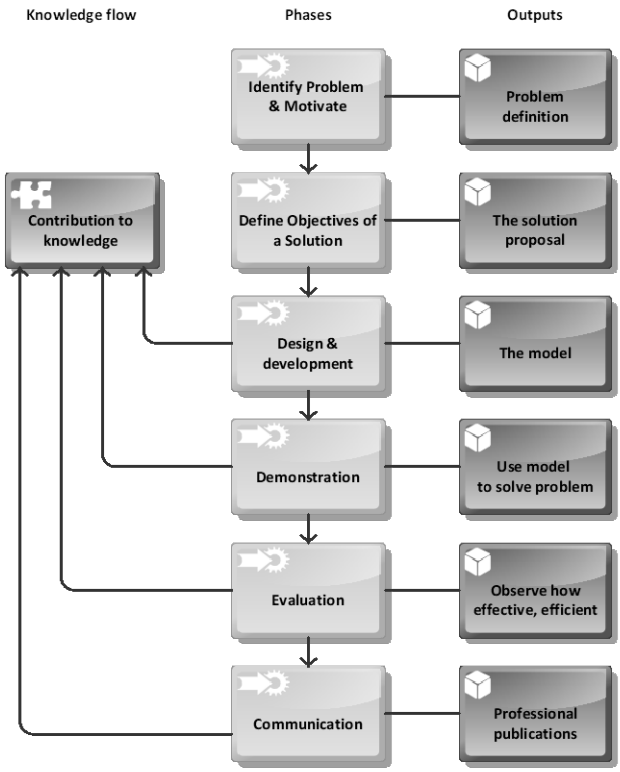

Figure 2: The design science research process model,
adapted from Peffers et al. (2007); vom Brocke et al. (2020b); Kuechler & Vaishnavi (2008).

3.1 Identification of the problem and motivation

We will begin by reviewing the relevant literature and in this way study theoretical starting points. This will allow us to identify problems from the literature. We will summarise findings in three fields. The first is patient care from a process point of view. The second is business process management (BPM). And the third is digital transformation.

We will address the identified problems in the context of Slovenia's health system, using the case study research methodology (Kljajić Borštnar, 2021; Yin, 2018). We will research the accessibility and use of data on treatments and output documents

on treatments with the help of a study of documentation and the use of real data within Slovenia's health system.

3.2 Definition of objectives and proposed solution

To construct the model we will use the systems development life cycle methodology (Dennis et al., 2014; Valacich et al., 2017), Fig. 3.

Figure 3: The systems development life cycle
(Valacich et al., 2017)

We will compare the number of hospital treatments with the number of discharge letters in the Central Register of Patient Data (CRPD). We will then compare these data with data on views of discharge letters. We will also compare data on prescriptions.

We will propose solutions to identify problems. In this way we will prove that the principles of system theory and business process management apply to the integrated lifelong provision of healthcare – and demonstrate how they do.

3.3 Design and development

On the basis of the findings from the previous step, we will develop, as the key part of the research, a conceptual organisational process model of lifelong continuity of patient care, using the design science research approach (Hevner, 2007; Hevner et al., 2004; vom Brocke et al., 2020b), Fig. 2.

3.4 Demonstration

We will present the developed model and provide answers to the research questions. We will show an example of the use of the model in the case of gaps between hospital treatments and the continuation of treatment following discharge from hospital.

3.5 Evaluation

We will evaluate the model through a process of confirmation by experts from relevant domains. We will use structured interviews in this phase.

3.6 Communication

We will publish the results as a scholarly article in a reputable journal, give presentations at scientific conferences and present the results to key stakeholders.

4 Preliminary/expected results

The results of the research to date are presented below.

4.1 Identification of the problem and motivation

We reviewed relevant literature on patient care from a process point of view, business process management and digital transformation. We identified the following problems from the literature:

P1 Organisational and informational gaps occur between treatments with different healthcare providers (Amelung et al., 2021; Bürkle et al., 2017).

P2 Attending health professionals are not always apprised of the activities of previous treatments (Amelung et al., 2021, p. 11; Bürkle et al., 2017).

P3 Attending health professionals are not always apprised of the drugs that have been prescribed in the course of previous treatments or the drugs that the patient is currently taking (Bürkle et al., 2017; Žerovnik et al., 2018).

P4 The fragmented nature of healthcare promotes duplication and the inefficient use of resources, which leads to gaps in care for patients with multimorbidities and reduces the general capacity of the health sector, since it forces the best health professionals to focus on specific conditions (*WHO Global Strategy on People-Centred and Integrated Health Services Interim Report*, 2015).

We identified gaps between different instances of treatment in the literature. Through our research, we will analyse these gaps and show, through the development of a conceptual model, how it is possible to reduce or eliminate these gaps.

We intend to transfer findings from the theory of business processes, which are generally applicable, to the field of the organisation of health systems. The treatment of a patient can be viewed as a process, while individual treatments can be viewed as phases and activities in this process. Here it is also necessary to define the process owner.

If we observe the integrated lifelong provision of healthcare to patients, we can understand the individual elements in the above definition as follows:

- The following can be understood as inputs:
    - health professionals – GPs, specialists, nurses, home care nurses, physiotherapists, care workers;
    - information – referrals, results, discharge letters, recommendations, prescriptions, procedures, treatment results.
- In this case, work activities are instances of treatment at different levels of healthcare – at the primary level, in specialist clinics and in hospital.
- The end result is the outcome of treatment.
- The client is the patient – newborn, patient, person taking part in preventive treatment.

The process is managed by the patient, who decides on their own treatment within the relevant legal and professional frameworks. The process is led by the process owner. We treat the general practitioner, in connection with the patient and the patient's relatives, as the process owner. Here, the general practitioner operates

according to the "case manager" principle and leads the overall treatment process. For more in-depth activities, the GP authorises specialists in other fields (with a referral, order form, work order).

4.2 Definition of objectives and proposed solution

We assume that organisational and information gaps exist between different instances of treatment. We intend to confirm this. We intend to prove that this is bad for the patient and a weakness of the health system. We also intend to identify how gaps form and show how they could be reduced or even eliminated.

Judging from experiences in other sectors, such as industry (Dumas et al., 2018; Hammer, 2015; Hammer & Champy, 1995, 2003; Keen, 1997; Keen & Knapp, 1995; Kern, 2018, 2022; Krhač & Kern, 2018; Urh et al., 2022), viewing patient care as a process could be one of the factors in the effective organisation and efficiency of the health system. It could increase quality of treatment and reduce unnecessary treatments, duplication of tests and total treatment time, thereby improving treatment outcomes, reducing the number of hospitalisations and, last but not least, bringing down costs.

In order to analyse the state of the problem, we obtained real data from Slovenia's health system. We found that analysis of collected data on treatments will make a significant contribution to proving the existence of gaps between treatments in practice. We obtained real anonymised data which, however, were not collected for the purpose of the research, so there is a possibility that some data will not be useful for the research and will therefore not be used.

We obtained real anonymised data on hospital treatments from the National Institute of Public Health (NIJZ) and real anonymised data on hospitalisations from the Health Institution Institute of Slovenia (ZZZS). We obtained real anonymised data on documents of the discharge letter type from the administrative module of the CRPD in the context of the eHealth system and data on prescriptions from the ePrescription database within the eHealth system. In order to analyse data on views, we will obtain audit track data from the administrative modules of the CRPD and ePrescription. In all cases we will use data for 2022.

We will conduct the analysis by comparing the number of hospital treatments with the number of discharge letters in the CRPD. We will then compare these data with data on views of discharge letters (Fig. 4).

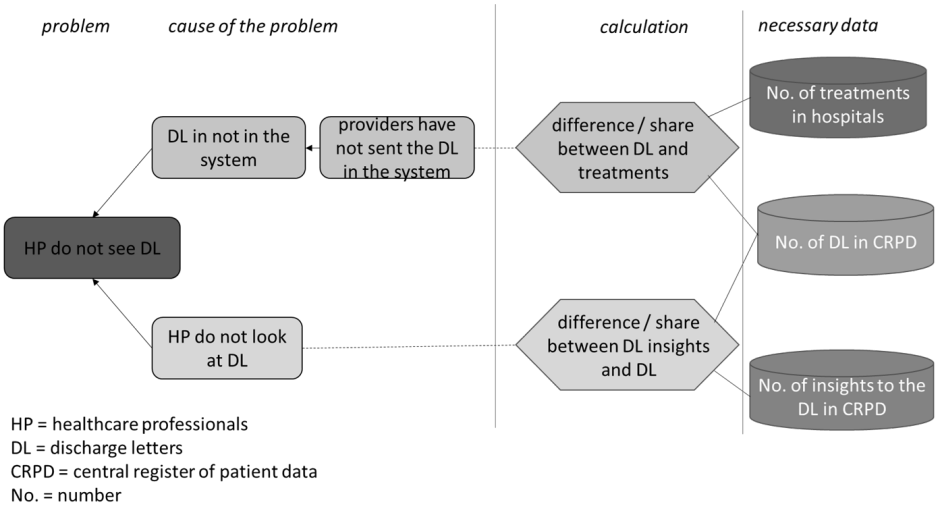

Figure 4: Comparison of data on discharge letters

The effectiveness of the treatment process and, consequently, the successfulness of treatment in a selected period, is frequently dependent on previous treatments and the information on these treatments that is accessible and used in the selected period (Bürkle et al., 2017; Stevens et al., 2022).

Access to data and information on previous treatments must be guaranteed in every instance of treatment. This is technically facilitated by established and functioning IT infrastructure and a single up-to-date repository. Data and information must be provided by the healthcare provider responsible for each treatment. Available data and information must also be used by the provider of the next treatment.

Information on previous treatments must be:

- accessible (if it is not accessible it cannot be used),
- used (information is not used despite being accessible and therefore available to be used).

4.3 Design and development

On the basis of the findings to date, we prepared a draft model. The model as we now understand it represents an illustration of the desired state (TO-BE) (Fig. 5). In it, we show a sequence of treatment instances as an organisational process from birth to death. In the real world this represents the life of an individual and treatments in the health system throughout their life.

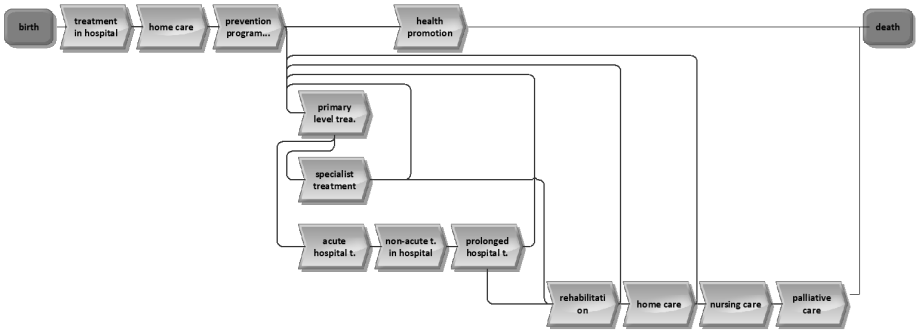

Figure 5: Conceptual organisational process model of integrated lifelong provision of healthcare to patients
(Rant, 2020)

During our research we established that, in order to design a new organisational model, it is important to research the information system associated with it. We find that:

- For successful implementation of the treatment process, access to data and information about past treatments is necessary.
- Access to relevant data and information about previous treatments must be provided to those providing current treatment at whatever level.
- Treatment providers must use data and information about previous treatments.
- A single repository is necessary, i.e. a central EHR. An example of this is Slovenia's Central Register of Patient Data.

This is shown in graphic form in Fig. 6.

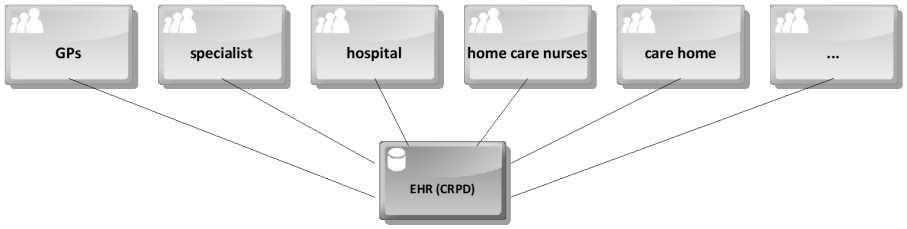

Figure 6: Integration and access to health data in a single repository, the central HER
Source: Own

Such a repository already exists in Slovenia. It is the Central Register of Patient Data (CRPD), in the context of the eHealth system.

4.5 Evaluation

We will evaluate the process model of integrated lifelong provision of healthcare to patients from the point of view of experts from relevant domains. The evaluation will make use of structured interviews. The experts/interviewees are expected to be doctors and nurses from the fields covered by the model.

We plan to divide them into three groups:

- experts in the public health field, who generally have a comprehensive view of treatment provision.
- experts in the field of hospital care and specialists, who in principle provide data, information and documents on treatments,
- experts in family medicine, who use information and documents from prior treatments.

We will conduct 3–5 interviews with representatives of each group of experts.
Outline interview content:

- we will explain the basic concepts, purpose, progress and results of the quantitative part of the research to the interviewees,

- we will verify whether they perceive gaps between successive instances of treatment,
- we will ask their opinion on whether medical documentation from previous treatments is needed when providing treatment,
- will verify whether they use medical documentation from previous treatments and in what form,
- we will verify whether they forward medical documentation on treatments that they provide, and in what form,
- we will ask them what they think about the integrated lifelong provision of healthcare and ask for their comments on the process model of integrated lifelong provision of healthcare to patients,
- we will verify whether they believe that the organisational model we have presented reduces gaps between different instances of treatment,
- we will verify whether they believe that a single repository helps reduce gaps between different instances of treatment.

5 Future development

Our research is focused on the organisational field.

1. We will model and analyse the system and processes of the existing situation (AS-IS). We will do so using the business process management (BPM) methodology and Aris 10 software.
2. We will analyse real data obtained from the Slovenia's health system.
3. We will prove the existence of organisational and information gaps between hospital treatments and primary care treatments.
4. We will design an artefact – a conceptual organisational process model of lifelong integrated healthcare provision for patients – that will be based on theoretical findings, process analysis, analysis of data obtained, the existence of organisational and information gaps, and practical experience.
5. As well as researching activities and transitions between activities in the process in the organisational sense, we will carry out detailed research of the information system associated with them.
6. We will show how the proposed model affects organisational and information gaps between instances of treatment.

7. We will publish our findings in a reputable scientific journal.

The results obtained from the research will contribute to an in-depth understanding of the integrated lifelong provision of healthcare to patients.

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