LEVERAGING HEALTH CARE SERVICES WITH CONSTRUCTION PROJECTS – THE ROLE OF ACTORS IN INNOVATION PROCESSES

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ABSTRACT

Of all health care construction projects mainly architectural and design aspects of hospital construction are discussed in the scientific literature. However, goals of hospital construction are always more complex. Medical-professional goals are related to design goals where the building provides appropriate environmental conditions to achieve cure-related goals. Hospital construction concepts have been changing over the years, from a set of pavilions to single-building hospitals to facilitate the "best medical practice", and provide the opportunity of "efficiency", "functionality" and "patient flows" These goals imply that patients are placed in a physical and psychological environment where their care and well-being is ensured in the hospital. This is often referred as "patient-centered care" in which "continuity", "accountability" and "patient education" are in the center.

In health care construction projects various actors have to collaborate with each other in planning and implementing the project, constructing a building. Thereby the project management tend to face considerable challenges. Research tend to focus on the implementation phase of construction projects, the actors from the "production" side are involved in most cases. Extant research has remained relatively quiet about the management challenges posed by actor diversity in innovating, and offers little empirical insight into how the benefits and drawbacks of actor diversity can be coped with during the longitudinal innovation process. The project that has to be carried out in collaboration with various actors can be regarded as an investment implemented in an "extensive network", and innovation within.

The paper refers to two case studies in which health care innovations implemented in an extensive network are explored. The preparation and implementation phase of each projects are analyzed in details. Research results show that mainly similarities can be found in the preparation phase of the projects, while differences can be found in the implementation phase. Both projects aimed to shorten the patient journey and to improve health care service delivery but one project seems to be less successful in supporting the organizational (health care service) innovation. The reason for that lies in the relations between and the behavior of the for-profit and non-profit actors of the projects. Research results imply that there are differences between the dynamics of the strategic nets of the two health care construction projects.

Keywords: construction project, health care, organizational innovation, extensive network

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INNOVATION IN THE CONSTRUCTION INDUSTRY

In the construction industry, diffusion of innovation and new technologies are slow in several countries (Andersen et al. 2004). Generally, the suppliers of materials and machinery are considered the main source of innovation (Holmen et al. 2005) and not architects or main contractors etc. The reason for that lies in a few other characteristics of the construction industry. One is that most work within this industry is project work. These projects are always relatively short-term works and unique in some respect therefore the project teams and the processes differ from project to project. The other reason is that the project owners (customers) use tenders to find the cheapest and the most appropriate contractors and suppliers for the work. Another reason could be that the design and execution phases of a construction project are often separated, so there is no time for the constructor to add in the planning phase.

What is well known about construction projects is that they involve a great number of specialized actors that need to interact in different ways during the course of the project (e.g. Dubois and Gadde, 2002, Havenvid et al. 2016 etc.) Depending on the project delivery form (i.e. the way it is financed, who is the project owner etc.) these actors will need to relate to each other in particular ways throughout the project. This makes actor interfaces a central part of how and if innovation can in fact be implemented. Barlow and Koberle-Gaiser (2008) who investigated the effect of private finance initiatives (PFI) to the UK's hospital program in terms of this project delivery form's ability to induce innovation also state this. They found that continuous interaction between actors play a crucial part in handling risk.

CONNECTION BETWEEN THE CONSTRUCTION PROJECT AND THE HEALTH CARE INNOVATION

Hospital construction is a complex project in which stakeholder rights have to be guaranteed. "Hospitals as a complex system of interacting environments, ranging in scale from the micro-spaces of treatment rooms and wards to wider "civic" setting in which the hospital is located. Though often implicit, a key idea here is that each of these needs to "work" to promote patients recovery and healing: in effect, they are imagined as "therapeutic environments"" (Gesler et al. 2004, p. 119.). Hospital construction concepts have been changing over the years, from a set of pavilions to single-building hospitals. "One of the dominant goals of hospital design is to facilitate what is concerned to be best medical practice. In discussing this goal, the literature employs such words as "efficiency", "functionality" and "patient flows"" (Gesler et al., 2004, p. 122.). Efficient management and new technologies are deemed crucially important.

These goals imply that patients are placed in a physical and psychological environment where their care and well-being is ensured in the hospital. This is often referred as "patient-centered care" in which "continuity", "accountability" and "patient education" are in the center. This concept is based upon research findings. For example an NHS report presented that patients ranked hospital environment as the number one priority (Gesler et al. 2004) suggesting that patient-centered design is more important than ever before. The building is an important element of the physical environment of the healing process. Patients and their relatives/visitors spend a lot of time in the hospital (not to mention the employees) and they are there to use the health care services that are offered. Patients move from unit to unit, receiving care from multiple medical units and teams. The way this patient journey (Ben-Tovim et al. 2008) is organized has a major impact on the patients experience and satisfaction and provides the

experiences for the level of perceived efficiency, functionality of the medical service. The efficiency of patient-centered health care is confirmed by health economic calculations primarily in terms of costs, a shortened patient journey leads to cost savings, thus care efficiency is enhanced.

THE HEALTH CARE SYSTEM AND INNOVATION FROM NETWORK POINT OF VIEW

Health care system may be defined as a complex network of individuals and organizations that include government agencies, health care delivery systems, business, media, non-profit organizations, private health practitioners, and academia (Gibbons 2007). Individuals more precisely the patients and the potential patients are in the focus of this hugely complex network as all the very different activities of the actors aim to cure or to prevent from different illnesses the individuals. Extending by the role of non-business actors (Cova et al. 2002) the industrial network definition of Axelsson and Easton (1992) we can say that the public health system network englobes actors involved in the socio-economic processes which convert resources to services for consumption by the end users who are the patients or in a more general view, who are the public, the members of an actual society.

Complex interconnectedness means another characteristic of health care systems. Connectedness refers to the notion that relations between organizations in a business network do not exist in isolation and are definitely affected by other organizational relations. Relations in the networks are connected to each and therefore embedded in the environment (Salmi 2000). Embeddedness refers to the interdependence between actors and the connections between relations, where the exchanges are dependent on other relations (Håkansson et al. 2009). All members are embedded in a network context, and development of one exchange relation depends on development of another. In other words, two exchange relations are connected to the degree that exchange in one relation is contingent upon exchange in the other (Ritter 2000). Actors in the network will adjust their behaviours or change their relations with other actors according to the change of relations they perceive (Corsaro and Snehota 2011). Therefore, any change of one actor or one relation will result in changes of other actors or relations interconnected in the network.

Interconnectedness, huge complexity of the network and the important role of non-business actors, above all that of the government, influences deeply the actors' possibilities of change. Studying the long-term behaviours of American public hospitals Ingram et al. (2012) pointed out that the hospitals' possibility to change and to develop is closely related to their relations with policy makers. Those hospitals developed well who had had good political relations and who had adversarial relationships with politicians were not really developing. Furthermore, those who developed well, acted in a more diverse and more complex network than the less developed hospitals. "However, given this diversity, as well as their reported superior performance, highly differentiated system may often be preferable to those showing less differentiation. If this is the case, then it is also possible to identify certain drivers of desirable vs. undesirable change" (Ingram et al. 2012:214).

In health care construction projects, various actors have to collaborate with each other in planning and implementing the project. Among these collaborators we may find firms, public organizations, regulators and policymakers, experts, universities, research organizations, user communities and associations as well (see e.g. Aarikka-Stenroos, Sandberg,&Lehtimäki, 2014; Biemans, 1991). The project that has to be carried out in collaboration with various actors can be regarded as an investment, at the same time an innovation implemented in an "extensive

network". In the analysis of innovation processes that are taking place in an extensive network Aarikka-Stenroos et al. (2017, p. 88-89.) define an "extensive network" "as a network setting which comprises a wide range of different actors and stakeholders (with regard to organizational logics, goals, discourses and cultures, along with technologies and industry sectors)."

The most important problem of the heterogeneity (public, private, professional) of actors is that they have different interest in such health care innovation projects. Van Bockhaven and Matthyssens (2017) analysed the behavioural challenges from the business actor perspective. On the basis of their single case study they give suggestions (paths) how to deal with the challenges. Their important result "is the recognition of the distinction between a field's value-creating system and its social-institutional system" (Van Bockhaven and Matthyssens, 2017, p. 81.)

As in every project, there are tightly and loosely involved actors as well. What is even more interesting is that the level of involvement of the actors might change during the evolution of the project. The advantage of having divers actors involved in the innovation process, provides the advantage of wider range of available resources and the possibility of multi-sectoral collaboration among the participants (Biemans 1991).

All of these characteristics of health care systems and projects raise the question of how to manage innovation in this complex, extensive network. In the literature of managing innovation networks we may often find the concept of strategic net. As a definition: "Strategic nets are formed by a few actors pursuing specified mutual goal(s) and having jointly agreed and contractually defined roles and responsibilities. Actors relinquish part of their autonomy to the net to achieve goals beyond their individual resources." (Möller and Halinen, 2017, p. 6.) There are three types of nets: current business net, business renewal net and emerging business network (Möller and Halinen, 2017). The work of Mason et al. (2017) raises the attention of the dynamics of strategic nets. For example among their research findings they note "that while the core members of the net remained quite stable, other actors were temporarily enrolled into its activities before moving on, while yet other market actors remained more distant,…(Mason et al., 2017, p. 66.) Their research results "suggests a dynamic conceptualisation of a strategic net, reproduced through its everyday practices." (Mason et al., 2017, p. 66.)

The success factor of innovation projects in extensive network is the effectiveness of network management. Planko et al, (2017) identified four categories of key factors: network composition, governance structure, managerial processes and relational factors. "Network composition involves the structural factors regarding the composition of the network. Governance structure comprises the structural characteristics that influence network governance. The cluster managerial processes contains the process factors, i.e. the core network management functions. The category relational factors comprises the personal and interpersonal factors (or 'soft factors') that influence network effectiveness." (Planko et al, 2017. p. 39.) The social interaction in network management is emphasized in the work of Matinheikki et al (2017). "One cannot hierarchically manage such interaction but only mobilize other actors through envisioning and framing. These tasks of the network architect or mobilizer are crucial moderators of collective formation of a system-level goal." (Matinheikki et al 2017, p. 130.) Aarikka-Stenroos et al. add: "it is not clear-cut who conducts managing activities and who is the object of managing but actor positions within the network may change along the process. (Aarikka-Stenroos et al. 2017, p. 92.)

RESEARCH AIMS

In this paper we introduce two case studies in which health care innovations implemented in an extensive network are explored. Through the case studies, the paper looks into how such projects can both drive and hinder new approaches to health care provision and organization within this national context. Each project aims to shorten the patient journey and to improve health care delivery which will be put into practice by organizational innovation, by the structure and the operation of organizational units that will be moving into the building. This collaboration and the newly organized patient journey involve substantial organizational innovation not only in the hospital block but also in the entire health care system of Hungary. From the strategic net aspect, we can interpret this innovation in an emerging business network, since "it is characterized by dispersed and vaguely identifiable ideas about the future involving great uncertainty concerning the actors, activities, and resources necessary for their realization" (Möller and Halinen, 2017, p. 7.).

However, there seems to be several drawbacks (on both personal and institutional level) related to accepting and utilizing this health care innovation. In this research, we are investigating the role of actors in innovation through the dynamics of the extensive network.

RESEARCH METHODOLOGY

Our study uses a multiple case study methodology. We selected two cases as multiple cases provide stronger evidence and provide the opportunity to compare and contrast two different projects with similar goals. We used retrospective approach in our research; a longitudinal, process based approach was followed to study the effect of a construction project on the success of a health care innovation in extensive network. Our paper was inspired by the logic of network process research (Bizzi-Langley 2012, Halinen et al. 2012).

The primary data sources include interviews, project documentation, publication and media data. During our qualitative research we conducted 12 expert interviews (6 for each cases) with project actors. On average one-hour interviews were conducted with project leaders and professionals (representatives of the project owners, the main contractors, architects, the project management, the government) who were involved in the design and implementation of the projects. Some of the documents we have analysed were publicly accessible, others were only partially accessible to the public.

Two Hungarian university hospital construction projects were selected for analysis. These projects were among the largest health care investments of the last decade in Hungary. As worn-out equipment and buildings create one of the major difficulties health care is facing currently, hospital construction and renovation is an essential step in the development process. The rationale behind our choice for this study lies in its importance. As the cases both represent large-scale projects that involve EU-level funding, they also provide the opportunity to investigate and discuss the role of different types of actors involved throughout the course of such large-scale construction projects. We will give an overview of the process of the two projects and the actors in the extensive network of the projects. The roles of actors will be introduced and discussed next.

INTRODUCING THE CASES

The **Korányi Project** that is situated in Budapest (capital of Hungary) was aiming to construct a new building in the garden of the hospital block of the Semmelweis University started in 2006. To construct a new hospital into this block of buildings, to move departments from most outdated and poorly equipped buildings and to house missing therapeutic areas seems to be a stopgap in itself. The hospital construction project was finished in 2015. Most departments started their operation but a part of the building remained empty, lacking equipment and department to use it. Therefore, we can conclude that this project only partly was able to reach its objectives. The building got ready, the construction was finished, however the medical innovation was only partly successful.

In the early 2000s, the management of the Albert Szent-Györgyi Health Center intended to resolve the health care difficulties by establishing a new hospital in Szeged (the third largest city in Hungary, located in the South part of the country). The goal was to develop an up-to-date inpatient and outpatient health care center that can satisfy the requirements of a 21st century Europe in terms of operation, equipment and services, that can integrate the fragmented and obsolete health care structure of the city and meet regional needs concurrently. The **Szeged Project** started in 2003 and was finished in 2015. The hospital building is finished and functioning; all the planned departments have moved in and operating in the new and well-equipped building. Therefore, we can conclude that the project was successfully finished.

The objective of both hospital construction project was to enable and facilitate medical-professional innovation, patient-centeredness and to make patient journeys shorter and achieve that care is organized around patients (not the patients are moving but the medical service providers, doctors visit the patients).

The Hungarian Health Care system – including the infrastructure in Budapest and in Szeged – mostly consists of hospital buildings that are almost 100-year-old and was built in the so called "pavilion system". These hospitals operate in separated buildings, and although they met the requirements of their age, since then both the system and the buildings have become obsolete. The main advantage of the pavilion system was to create an environment that can satisfy hygienic requirements, that is, to ensure that the risk of infection is reduced. This system has become outdated both in technical and economic terms, furthermore, there are more advanced technologies to create hygienic conditions, therefore there is no need to maintain buildings separately. Neither for this reason. Due to separately located buildings health care delivery had to face various difficulties, efficiency was hindered. On the one hand, surgical wards were often built and diagnostic tools installed separately in various buildings, thus inefficient utilization raises economic questions. Furthermore, the maintenance and operation of the buildings carry significant costs. On the other hand, fragmentation of care delivery is another negative feature of the pavilion system, as a result of which patients and medical staff have to shuttle between buildings because frequently more than one hospital unit is involved in the treatment of one patient. Additionally, the pavilion system is disadvantageous to interdisciplinary collaboration as well, as various disciplines are housed in various buildings and on various sites, collaboration becomes cumbersome, needs more time and leads to patient dissatisfaction.

Under these circumstances it has become increasingly urgent to improve the efficiency of care delivery both in economic and medical terms, to rationalize patient journeys, and thereby to enhance patients' satisfaction, thus to build new hospital facilities, single-building hospitals in line with the European and Hungarian recommendations in which advanced care can be provided for the population.

Finally yet importantly, it cannot be ignored that additional to care delivery, university hospitals have two more goals to work towards efficiently. On the one hand, as a university, it is an essential task of the University Hospital to provide theoretical and practical education, and on

the other hand, to ensure opportunities for scientific research that can considerably influence the prestige and the societal role of the University, similarly to the Karolinska University Hospital that was regarded as a standard for European health care development.

PREPARATION PHASE OF THE PROJECTS

The Korányi Project started in 2006. The idea was generated partly by the investment need of the Hungarian health care system, and partly by an opportunity to apply for EU grants. Governmental bodies whose task is to invite and manage tenders tend to talk to stakeholders, make suggestions before they select large investment projects.

Political will, governmental bodies and regulations play decisive role in the preparation of the project. University actors start to think about the project, and project planning is triggered. Since the university needs financial support from the government, a multiple stage, usually very time consuming interaction between the representatives of the university and the government takes place in this phase. Because of this the ongoing planning process might slow down or even stop and then start again with a somewhat different project content. The procedure that originally started in 2006 went through similar interruptions, and in 2011 when the tender was approved, the sixth version of the project was accepted.

Very similarly to the Korányi Project, the planning phase of the Szeged Project had to be restarted several times between 2003 and 2008. The size of the project was decreasing proposal-by-proposal (originally started with a 1500-bed Euro-Regional Hospital). The University of Szeged (project owner) lacked sufficient resources to devote to the development program aiming to renew care delivery, therefore they requested support from the government. Negotiations were conducted in several stages to acquire financial resources, the university attempted to include Hungarian state financing, EU funds and even private equity but in the end the Hungarian government refused to support the project. The then under-secretary of the Ministry of Finance explained, *"...seriously, nobody could have believed that a copy of the (Swedish) Karolinska University Hospital could be built in Hungary."*

During the redesign procedure, the University put together a smaller project for health care delivery aiming to enhance efficiency and shorten the patient journey. As a result of the development, the seven oldest building was planned to be closed down and withdrawn from care provision.

IMPLEMENTATION PHASE OF THE PROJECTS

The implementation phase of the Korányi Project started in 2011, the project proposal was accepted, decision was made both about EU funding and the amount of the Hungarian fund.

The University with its extensive internal institutions makes a complex system of relations, a network of interdependent departments and offices. The decision-making procedure of the University is bureaucratic, its operation lacks flexibility, and it is far from the dynamism and vigor of a for-profit organization. To overcome this problem, the University set up a project management unit with dedicated decision-making rights. whose task is to manage relations between an organization with bureaucratic decision-making mechanism and the business sector.

In this phase of the project, the University's main task was to control and support the work of the designer and later the constructor organizations.

The project was completed in 2015, or precisely was declared complete. This means that the building was completed, and some equipment was installed, then several departments and hospitals could move into the building, partly into the pre-planned structure.

In Szeged, following the preparation and implementation of the relevant public procurement procedures, organizations that took part in the construction were commissioned from 2009 onwards. The construction designer started working in 2009 and the general contractor and the subcontractors started the project in 2011. During the construction the University entered into agreement with about 40 organizations, although in the effective construction several other sub-contractors were involved, thus the number of directly involved constructors came to two hundred who were either general contractors or sub-contractors.

The project was being implemented in continual discussion among representatives of the university (the project management and the involved health care units), the designers and the general contractor as well as the affected sub-contractors. These occasions provided opportunities to discuss and remedy occasional problems and carry out the needed modifications. The project was completed in the summer of 2015 and following the relocation, the new hospital building was inaugurated in December 2015.

DISCUSSION AND CONCLUSIONS

As in all large scale construction projects, a large number of profit oriented and not-for-profit organizations were involved in the analysed hospital constructions. The different actors played different roles during the project (see the extensive network of project actors in the Appendix). The figure in the Appendix contains the internal, external and the extensive network and the actors in a schematic view. The relation between the extensive (EU and national governmental bodies) network and the internal (university, clinics) network has more importance in the preparation phase. While the relation between the internal and the external (design and construction) network has more importance in the implementation phase of the projects. In the preparation phase the authorities and the project owner (the university) played the most important role. The terms that were set first by the European Union for financing special areas of development in Hungary than the guidelines that were formulated by the government defined the frame for the projects. However, with the rule and recommendation changes that occurred during the project planning process, they caused important barriers as well.

The project owners level of experience with large-scale construction projects had crucial effect. In the Korányi Project the project owner was Semmelweis University, the largest medical university of the country. It has extensive experience in medicine, it owns and manages a multi-functional set of buildings, such as the hospitals, whose primary function is health care delivery. The University has all the experience and competence the preparation, the public procurement and the implementation of a smaller project needs but the University has not gone through such a large-scale investment before. It had no experience with such a large-scale investment. On the other hand, the Szeged Project was managed better because of the expertise the project owner, the University of Szeged gained during the construction of the Study and Information Centre (a 25.000 square meter large educational and library building) that was finished in 2005, right before the planning of the new hospital building. This experience proved to be a big advantage in managing the processes.

Another important difference between the two projects is that in the Korányi Project the composition of the medical units to move in to the new building has changed after the planning and architectural designing phase of the building. This resulted in expensive changes during the construction and the relations between the constructor and the health care actors became fragmented, and as constructors work under time pressure, they were becoming less and less motivated to consider the changing health care aspects.

With this analysis, we managed to show that a successfully implemented construction project could be the vehicle for conveying innovation to health care services. However, the two cases have different results. The medical service innovation was only partly achieved in the Korányi Project implemented in Budapest. What has led to this situation? An overall reason is that the University management failed to deal with the medical process development, they focused mainly on the construction part of the building. Another reason is that representatives of medical professions were not involved deep enough in every phase of the project. The major reason, however, lies in the state of the health care system in which a senior manager is disinterested in moving the department to a new integrated service center (despite of the better environment that could improve the efficiency of cure and serve for the interests of patients) to avoid losing power. This part of health care innovation cannot be implemented because of the behavior of actors in power, some interviewees said "*the Hungarian health care is immature for this innovation*". These findings revealed crucial problems in network management, but these problems can not only be charged to personal and interpersonal factors (Planko et al, 2017), but a larger extensive, economic policy problems.

As a summary we can conclude that both construction projects have been completed from architectural point of view. The projects achieved their goals from the viewpoint of construction. The designed buildings have been completed with appropriate functionalities, and have come into use.

The rationalization goal was to ensure economic and more efficient operation, which seems to be achieved by eliminating parallel operations, establishing central units, introducing a unified logistics and integrated management systems. Additional argument to persuade doctors that due to central location, opportunities open up for more efficient interdisciplinary collaboration in more efficient forms than before. It can be easier to allocate tasks across disciplines, or due to shared background facilities (central operating theater, central intensive department) care management can become easier and more cost-efficient.

From a patient care viewpoint, the most important goal was to simplify patient journeys. However, the success of an approach that was hardly applied before as a formal organizing principle in the Hungarian health care system does not only depend on architectural solutions, accepted international recommendations, and national guidelines. Although creating conditions for patient-centered operation the hospitals are ready to deliver patient-oriented care but without accepting, applying organizational, and management restructuring, emerging conflicts cannot result in a more efficient operation than before. Therefore, it is particularly important to measure experiences with the operation, to familiarize involved managers and medical staff with patient-centered care provision, that is, to shape the attitude of affected health care staff.

A construction project analysis covers the implementation phase only. Using the extensive network approach, we managed to highlight that the analysis of the preparation phase is important as well. The frame of the project is set in the preparation period, therefore the organizations that are involved in the preparations can make a strong impact on the outcome even despite of the fact that they are not involved directly in the implementation phase. Through the two cases we could identify the dynamics of the extensive network in the preparation and in the implementation phase. In the future it would be useful to analyse how the different network management activities can be adjusted more efficiently to these kind of complex projects.

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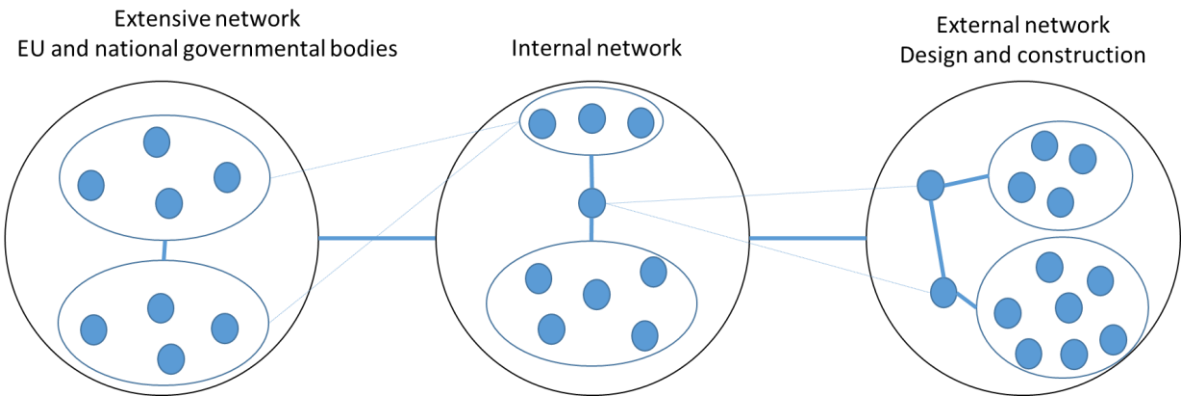
Appendix

The extensive network of the project actors



Project actors

The successful completion of the project required collaboration from various actors. Various actors played key role in the various stages of the project.

Network of internal actors: several units and officials of the project owner is represented here. Additional to the top management of the University (the Rector and the Financial and Technical Director, Chancellor from 2015 onwards), the Senate, the Rector's Comissionaire as the head of the project Supervisory Committee, the Project Management Office and the directors of the involved departments have been directly involved in the project. This list clearly reveals that the University as a typical public organization has a hierarchical, rigid and inflexible decision-making structure.

Network of external, governmental and institutional actors: Can be divided into two groups of European and National actors. European Regional Development Fund as one of the main funders of the investment ensures that the development priorities of the European Union are achieved. The Hungarian Government (Ministry of Human Resources, Ministry of National Development, and Ministry of Finances): the system of national and European Union fund resources is managed to ensure that EU Directives and national rules of law are complied with and strategic development directions are considered. The Ministry as the maintainer of the project owner (the university), takes part in the project also as a direct regulator. In the design phase, the city government played a particularly significant role.
In the tendering system, it is the task of the Strategic Research Institute of Healthcare (then its successor, the National Institute of Quality and Organizational Development in Healthcare and Medicines) to supervise the quality of the project.
Since the Szeged Project became an EU JASPERS, the joint project organization of the European Commission, European Investment Bank and European Bank for Reconstruction and Development, assumed major project the advisory role in the preparatory phase.

Network of external for-profit organizations: Several actors participated in the design and implementation phase of the construction project. Actors can be divided into two groups according to the role they played.
General architect and consultant designers: the design firm and their sub-contractors who were involved in engineering.
General contractor and sub-contractors: the contractor is a consortium of a smaller firm and a general contractor company. Almost 200 organizations took part in some phase of the construction either as sub-contractors or as direct suppliers.