Collective action in national e-health initiatives

Findings from a cross-analysis of the Norwegian and Greek e-prescription initiatives

Polyxeni Vassilakopoulou[1], Aleksandra Pesaljevic[2], Nicolas Marmaras[3] and Margunn Aanestad[2]
[1]Department of Information Systems, University of Agder, Kristiansand, Norway polyxenv@uia.no
[2]Department of Informatics, University of Oslo, Oslo, Norway
[3]National Technical University of Athens, Athens, Greece

Abstract
In this study, we examine the introduction of e-prescription in Norway and Greece as a process towards achieving embeddedness within the existing information systems´ landscape of healthcare. This requires action taking by public sector actors at different government levels and also, by private actors. We used the lens of collective action for informing our investigation. Our analysis brings to focus the mechanisms of making initiatives happen when participants have the freedom to make individual decisions on their contributions, structuring their work in the best way they consider fit. Specifically, we identified how the solutions evolved through voluntary cooperation, strategic interaction and selective incentives. Our findings contribute to to the extant literature on national e-health solutions shifting the focus from the important technical issues of standardisation and integration to the equally important issue of creating the conditions for collective action.

Keywords
Electronic prescribing, digitalisation, collective action

1 INTRODUCTION

E-prescription solutions capture and circulate prescription information between prescribing doctors, pharmacies and insurers that handle related payments. The digitalisation of information flows eliminates practical legibility issues (frequently faced when using handwritten prescriptions) while significantly improving auditability. Overall, such solutions contribute to cost containment, enhancement of patient safety, visibility over doctors' prescription patterns and process quality assurance. In this respect, e-prescription has a dual role: it is a tool introduced to everyday work to improve healthcare delivery and also, a mechanism for regulating, controlling and monitoring a large array of dispersed temporally and geographically professional tasks related to prescriptions' issuing, dispensing and reimbursing (Vassilakopoulou et al., 2012). Overall, putting e-prescription in place entails working with multiple and diverse sociotechnical components, finding ways to link and organise them (Rodon and Silva, 2015). During the past decade, most European countries had to address increasing healthcare costs and this fuelled the interest for e-prescription systems across Europe (Aanestad et al., 2017). According to the World Health Organization, pharmaceutical costs account for three of the most common causes of health systems' inefficiency: reducing unnecessary expenditure on medicines, using them more appropriately, and improving quality control, can contribute to significant health expenditure reductions for most countries (World Health Organization, 2010).

In Norway, the government initiated e-prescription back in 2003 with the aim to solve problems in payments´ settlement for pharmacists and bandagists related to the circulation and processing of paper prescriptions (Pesaljevic, 2016). It was important for the authorities to monitor and control prescriptions not only for ensuring healthcare quality but also for reasons of cost control. The introduction of e-prescription in Norway has been a lengthy and challenging process entailing concerted action from multiple actors that developed extensions for a multitude of existing systems (Hanseth and Bygstad, 2017). Although it was initiated in 2003, it took almost a decade to reach full deployment.

The Norwegian e-prescription solution supports the registration, circulation and storage of information about patients (including their unique national identification number), prescribers, prescribed medicines and dispensing pharmacies. The registration of information is performed via the Electronic Patient Record (EPR) systems and Pharmacy Management systems in doctors' offices and pharmacies. The Patients can go to any pharmacy to fill their prescription and there is also the possibility to use e-pharmacies. Furthermore, the information on filled prescriptions is shared with NAV (the Norwegian Labour and Welfare Administration) for control and refunding. E-prescription is used both in primary care and in hospitals.

Paper from the 15th Scandinavian Conference on Health Informatics SHI2017, Kristiansand, Norway, 29 - 30 August.
Conference Proceedings published by Linköping University Electronic Press.

In Greece, the overall aim for e-prescription was to enhance control over pharmaceutical expenditure, to improve doctor-pharmacy collaboration and patient safety and to capture data required to support policy development (Law 3892/2010). The year when the e-prescription law passed (year 2010) the Greek economy was facing a severe public debt crisis which captured global attention. The strong financial motivation behind the e-prescription initiative is demonstrated by its inclusion in May's 3rd 2010 "Memorandum of Economic and Financial Policies" between Greece and the International Monetary Fund and subsequently in the "Hellenic National Reform Programme 2011-2014" (Vassilakopoulou and Marmaras, 2013; Vassilakopoulou and Marmaras, 2015). Differently to Norway, the deployment of e-prescription in Greece was swift: development started in 2010 and by 2013, reached almost full coverage (Papanikolaou, 2013).

The Greek e-prescription solution supports the registration of information about both the patient and the prescriber, the diagnosis, the medication specifications (type, quantity) and directions for the patient to follow. Prescribing doctors register the patient's name and social security number, the diagnosis encoded according to ICD-10, and the medications prescribed and then, print a summary page which is handed to the patient. Patients can visit any pharmacy to fill prescriptions. Before delivering medications, pharmacists scan the medication packages' barcodes which are then matched to prescription details. The information on filled prescriptions is sent to reimbursement authorities. Several rules related to reimbursement are inscribed in the e-prescription solution (e.g. different percentages for patients' share of costs). The rules inscribed are not only related to reimbursement. Therapeutic prescribing protocols for a series of conditions (i.e. diagnosis-based prescribing guidelines) have also been electronically implemented. The protocols include medication of "first choice", secondary medications, alternative therapies and rare cases. E-prescription is used in primary care and in hospitals.

Both e-prescription initiatives entailed introducing new technologies not as standalone objects, but as elements in larger infrastructural arrangements. Working within healthcare is especially challenging today because novelty has to link to historically built conventions of practice and to technologically congested landscapes that are the outcome of intensive digitalization efforts undertaken during the last decades (Grisot and Vassilakopoulou, 2017; Grisot and Vassilakopoulou, 2015). This makes the introduction of new electronic systems more challenging than it was a couple of decades ago when e-gov initiatives were starting in other public-sector domains (e.g. tax authorities). Earlier initiatives encountered less populated and less diverse technological landscapes than the ones found today. Nowadays, national-level digital initiatives rely on synergizing with many actors to achieve embeddedness (Bietz et al., 2010; Monteiro et al., 2013).

We examine the introduction of e-prescription in Norway and Greece as a process towards achieving embeddedness within the existing information systems´ landscape of healthcare. This requires action taking by public sector actors at different government levels and also, by private actors. By focusing on the embeddedness concern, we can use the lens of collective action (Fulk and DeSanctis, 1995) for informing our investigation. The literature on collective action grapples "with the age-old problem of how to induce collaborative problem solving and other forms of collective action among self-interested individuals, groups, or organizations, assuming, of course, that they share at least some common goals" (idem, p. 60). This lens fits a situation where heterogeneous actors must develop or extend complementary resources through a dynamic process of collaboration. Heckathorn analysed collective action based on three underlying mechanisms: voluntary cooperation, strategic interaction, and selective incentives (Heckathorn, 1996). As collective action is a multifaceted phenomenon, all three mechanisms are important. In voluntary cooperation, actors choose between two strategies (cooperate or not) forgoing any attempts to influence others. In strategic interaction, actors make their choices conditional on others' choices according to principles of reciprocity. In the case of selective incentives, laws or social norms that punish defectors or reward co-operators are employed to facilitate collective action.

The remainder of the paper is structured as follows: first, we present the method used for collecting and analysing our empirical material, then, we present the results of our investigation, finally, we discuss and conclude by pointing to the contribution of this research and further research directions.

2 METHOD

The research reported in this paper is based on a multiple case study research design (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). Multiple case studies allow for comparison across cases, resulting to more robust conclusions (Yin, 2014). Being focused to a single case could result to naturalising many of their aspects or making them look too singular. This combined view allowed us to be sufficiently attentive to details without losing sight of the overall picture.

Data were collected from on-line sources, documents, observations and interviews with key actors (Table 1). As a first step, we performed ''within-case analysis'' which led to the development of timelines for the two cases and preliminary narratives on their evolution. In the second step, we applied a cross-case analysis in order to look for patterns across the cases. At this step, we turned to the literature on collective action for dimensions around which we could cluster episodes identified during the first step of our analysis. Specifically, we looked for voluntary cooperation, strategic interaction, and selective incentives following Heckathorn (1996). This analysis helped us explore how e-prescription solutions were made possible through collective action.

Case	Data source	Description
Norway	Interviews	Semi-structured interviews with professionals involved in the development of e-prescription and professionals with domain specific knowledge (21 in total).
	Observations	Attendance of project meetings and workshops (50 meetings, 10 workshops).
	Document analysis	Norwegian Healthcare Strategic Documents; Policy, Regulation and Standards Documents; Project Documents.
Greece	Interviews	Semi-structured interviews with professionals in the domain (7 in total).
	Observations	On-site observations of e-prescription use in pharmacies for three full days.
	Document analysis	Legislation and guidelines, policy documents and strategic plans, press releases, public consultation documents, presentation documents, posts in professional electronic forums, press and articles.

Table 1. Data Collection

3 RESULTS

3.1 Overview of the two cases

E-prescription was introduced in both Norway and Greece with the aim to be all-inclusive (covering primary and secondary care), for the whole country and allowing patients free choice of pharmacy for prescription dispensing. This makes the two cases comparable. The Greek and Norwegian cases covered similar functionalities and were pursued to a great extent through centrally decided and implemented development plans (in Norway led by the Directorate for Health, in Greece led by the Greek e-Government Centre for Social Security). These similarities are important because, within Europe there is a great variety among e-prescription initiatives (Aanestad et al., 2017). For example, in England, a specialized e-prescription service only for primary care was introduced. In Spain and Italy, initiatives were taken at the region level. In Sweden, there was a decision to transmit electronic prescriptions to selected pharmacies, so patients could not walk-in to any pharmacy.

Regarding motivations, the cases have a lot in common. Firstly, they both aimed for cost containment, partly through automating parts of the overall process, but also through enhanced monitoring of drugs' expenditures and physicians' prescribing practices; also, they aimed for improving patient safety and for improving the overall quality of the service delivered to patients. In Greece, the economic situation of the country played a role in pushing the project forward. The project was run during a difficult period for the Greek economy, and this accelerated the introduction of new electronic tools to reform the healthcare sector. In Norway, the project was initially triggered by the Office of the Auditor General's critique of inadequate monitoring and control of costs related to drug use. However, in order to ensure physicians´ buy-in, the focus of the project changed early on from monitoring, control, and cost containment, towards improving patient safety. Table 2 provides an overview of the temporal evolution for the two cases.

Period	Description
Norwegian e-prescription	
2003-2004	Decision to initiate e-Prescription
2005-2006	Starting e-Prescription program
2007-2008	Tender First Pilot (stopped after significant problems)
2009-2012	Re-planning Successful pilot and rollout Prescribing Module developed
2013-2016	Extensions including: multidose dispensing, online-pharmacies and new projects for further extensions
Greek e-prescription	
2010	Decision to initiate e-Prescription
2011	Pilot and rollout
2013	Coverage 98%
2013-2015	Extensions including: therapeutic protocols, caps for prescribing doctors, diagnostic test ordering

Table 2. Temporal evolution of the e-prescription cases

Both e-prescription initiatives started with a focus on paper prescriptions and aimed at first to digitize the paper-based prescribing processes. They started with the (implicit) strategy of replicating existing paper-based practices and then, to a varying degree, enriching these with additional functions for detection of medication errors and decision support that would improve patient safety. However, both projects, while trying to stay close to the existing practices, had to find appropriate strategies for addressing challenges.

The Norwegian and Greek projects employed almost opposite strategies for dealing with the existing technological solutions. In the Norwegian case, the strategy chosen was to integrate tightly the e-prescription modules implementing new functionality within existing systems, in particular Electronic Patient Record (EPR) and Pharmacy Management systems. Due to the comprehensive functionality specified, the project

required extensive work from the vendors´ side. The vendors had to develop new and quite complex software components, modify their existing solutions, and integrate them to the national e-prescription solution. This resulted in a situation where the overall project became dependent not only to the activities of the vendors directly involved in the e-prescription project, but also to the overall situation within the vendor organizations. For instance, the project was slowed down by one vendor's delayed development of a new product.

Differently from the Norwegian project, the Greek one developed first a simple solution based on easily available and straightforward web technologies without pursuing integration with the Electronic Patient Record and Pharmacy Management systems that were already in place. These integrations were made possible at a later stage, after the initial launch of the simple standalone solution. Due to economic and political commitments, the initial solution was developed within a very tight timeline and was launched within less than a year from the moment that development started. This is in contrast to the Norwegian solution in terms of both complexity and time. The actual "rollout" of the solution in Norway started eight years after the project was initiated.

The Greek solution was first extended by developing and providing Application Programming Interfaces (APIs) that the vendors of Pharmacy Management and Electronic Patient Record systems could use to integrate their solutions with the infrastructure. Then, various new functions were added such as the electronic implementation of therapeutic prescribing protocols, and diagnostic tests´ ordering. These extensions were implemented swiftly. This was possible because the e-prescription solution was based on an expandable component-based architecture (Vassilakopoulou and Grisot, 2013). In addition, the initiative was run and maintained by a small centralized organization that had flexibility in modifying the solution. Overall, multiple changes have taken place as a sequence of small steps.

The Norwegian e-prescription solution is significantly more complex than the Greek one. Furthermore, the Norwegian solution was expanded beyond the traditional prescription areas. Specifically, it expanded into medication management of polypharmacy patients at home and in nursing homes through the development of new functionalities for supporting Multi-Dose Dispensing. Also, an extension was developed to support ordering of prescription medications through online pharmacies. Recently, additional initiatives were launched. A comprehensive and updated overview of patient´s medications at a given time is being developed. This new development is practically signalling the phasing out of the document logic of prescriptions (which was the starting point in the e-prescription journey). A generic, semi-independent component for electronic patient record systems (named FM or prescribing module) was pivotal for the successful deployment and evolution of e-prescription. FM was initially used to secure deployment of e-Prescription nationwide, making it much easier for EPR vendors to add e-prescribing functionality when their in-house development efforts were not advanced (the estimated cost of linking an existing EPR to FM is 1/100 of the cost required for developing all the functionality that the FM module covers). FM was built having in mind some of the EPR vendors that were lagging behind in development and also smaller vendors that develop systems for health practitioners with low prescribing volumes (e.g. dentists, ophthalmologists) but, eventually it was used also for adding e-prescribing functionality to hospital systems and to the systems used in community care (Pleie- og omsorgstjenesten). The introduction of FM facilitated significantly the large scale deployment of e-prescription which started in 2011. By 2013 e-prescription was in use by Doctors and Pharmacies throughout the country. The central project organization used this module to develop the new functionalities in an experimental fashion being able to test prototypes and launch pilots without involving application vendors.

3.2 Collective action for the introduction of e-prescription

Starting from the three Hackathon´s fundamentals we look how the solutions evolved through voluntary cooperation, strategic interaction and selective incentives in the two cases.

Voluntary cooperation

The Norwegian e-prescription is based on voluntary initiatives (Norwegian: dugnadstiltak). Each party in the e-prescription value chain is responsible not only for the system(s) owned and controlled but also for the overall e-prescription function. The electronic prescription program is anchored on national policies and action plans but relies on the contributions of multiple parties and without their participation it would have not been possible. Although the idea was to base everything on the voluntary cooperation of key actors, the overall architecture of the solution is such that there is full dependency on developments performed by each involved party. A Cooperation Agreement for developing e-prescription (Samhandlingsprotokoll) was signed between the Norwegian Ministry of Health and all involved parties at the end of 2006. Nevertheless, the agreement was not enough for securing actual participation. One of the initial steps was the launching of a call for vendors to extend existing EPR systems with prescribing functionality. In this initial call, only one EPR vendor responded. This company was developing at that time a new EPR product. An agreement was made and a pilot was planned for the beginning of 2007. This plan proved to be overoptimistic and was later revised. Eventually, e-prescription was piloted in May 2008 but it was not satisfactory and was eventually stopped mainly due to the overall immaturity of the new EPR product. This created the need for re-planning the initiative.

In Greece, the initial versions of e-prescription in the 2010-2011 period were only accessible via web browsers. There was no connectivity to the EPRs used by doctors or to

pharmacy information systems. The idea was that EPR vendors and vendors of pharmacy information systems would be able to develop at their own pace prescription modules for their systems at a second stage. This was made possible with the publishing of Application Programming Interfaces (APIs) that allowed connectivity with doctors' and pharmacists' systems. The APIs for pharmacy systems were launched in 2012 and were subsequently used by multiple system providers connecting the majority of pharmacies (by the end of 2012). In 2015 the APIs for doctors' EPRs were launched. The introduction of the APIs and their exploitation by third party system providers allowed e-prescription to get embedded to the health IT landscape gradually.

In Norway, there is a relatively limited number of vendors providing EPRs and pharmacy systems (eight different EPR systems from six vendors used by hospitals and GPs, also, at that time all pharmacies were using the same solution which was developed by a software company owned by the pharmacists' association; as of 2017 there are three pharmacy systems). Differently to this, in Greece there is a multitude of EPR and pharmacy system providers. It was virtually impossible to expect all parties to cooperate within the limited timeframe. Hence, a browser-based solution was launched first and subsequently APIs were published for voluntary use by system providers. Furthermore, the Greek health IT landscape was not only characterised by the diversity of pharmacy and doctor systems but also by the high fragmentation of social security. There were many different social security funds in place with their own registries and systems in place. In January 2011, the service was officially launched in 4 social security funds. In 2012 four more additional funds were included. Each addition necessitated collaborating with the different funds to establish information exchange.

Strategic interaction

When collective action is organized through strategic interaction, some actors make their choices conditional on others' choices. This is different to pure voluntary cooperation where participants take action irrespectively of the choices of others. In 2010, in Norway the development of FM started. FM was conceptualized as a generic, semi-independent component of existing EPRs; all information exchanges with e-prescription actors would be taken care of by this module but it would not be functional in a standalone basis (i.e. not possible to run without an EPR). FM could be used in the case of further delays in EPR vendor deliveries. FM was initially used to secure deployment of e-prescription nationwide, making it much easier for EPR vendors to add e-prescribing functionality when their in-house development efforts were not advanced. Actually, it was an adjustment to the strategy of the Health Directorate based on the experience they had with the vendors in the earlier stage. FM was built having in mind some of the EPR vendors that were lagging behind in development and also smaller vendors that develop systems for health practitioners with low prescribing volumes (e.g. dentists, ophthalmologists) but, eventually it was used also for adding e-prescribing functionality to hospital systems and to the systems used in community care (Pleie- og omsorgstjenesten). The FM module was offered to all EPR vendors without charge for its use. For its implementation, vendors had to develop connections to their own systems and to handle user support.

In the Greek case, the main challenges encountered related to ensuring information flows with the social security funds. When e-prescription was first introduced the funds were maintaining multiple electronic registries for their members and several of those registries were incomplete. In an initiative parallel to e-prescription, a new system named ATLAS that includes a new national registry for all healthcare beneficiaries was developed and launched by Greek e-Government Centre for Social Security in 2014. ATLAS links multiple registries and supports the flow and storage of information on insurance status and social insurance contributions. This new system was linked to e-prescription in the summer of 2014.

Selective incentives

Collective action among large groups can also be achieved with the use of selective incentives, such as laws or social norms, penalties for defectors or rewards for co-operators. In both the Norwegian and the Greek case, special laws were introduced for electronic prescription. Furthermore, the aim was to achieve universal coverage, i.e. electronic prescription to become the norm. In Norway, vendors were reimbursed for their expenses while in Greece, it was the vendors themselves that had to cover the costs (possibly transferring the cost to the end-users or incurring it themselves with the expectation to expand their user base). Furthermore, in Norway, at the pharmacy side, e-prescription was based on a newly developed pharmacy solution. As the new pharmacy system had to be deployed in multiple pharmacies, the software company developed a middleware named migration-factory to speedily deploy the new system across Norway. Practically, the migration-factory was a demand from the Health Ministry as it was critical to ensure the possibility of dispensing electronic prescriptions from all pharmacies and not only from selected few.

4 DISCUSSION

The development and implementation of e-prescription solutions required attention to the distinct capabilities and interests of various actors while leveraging voluntary cooperation, strategic interaction, and selective incentives. As the analysis of the two cases shows, there are many different alternatives for the development and implementation of e-prescription and the configuration for each setting depends on the particularities of the actors, their capabilities and interests. By applying the lens of collective action (Fulk and DeSanctis, 1995; Heckathorn, 1996), we provided an overview of the creation of fully functional solutions that depend on contributions from multiple actors.

The findings from the study have implications for both research and practice. Regarding research, this study contributes to the extant literature on national e-health solutions shifting the focus from the important technical issues of standardisation and integration to the equally important issue of creating the conditions for collective action taking. By analysing the development of e-prescription as collective action we illuminate how novel technical capabilities can become embedded to the technologically congested landscapes that characterize healthcare today. Regarding practice, findings from our study can inform both public and private actors involved in large scale e-health initiatives. Since our research only investigated a specific type of e-health solutions (e-prescription) which supports both healthcare related and administrative needs our findings might not be generalizable to all types of e-health solutions (for instance, the voluntary cooperation mechanism might not be applicable in some cases). Therefore, further research in large scale e-health initiatives with the lens of collective action is needed.

5 CONCLUSION

The e-prescription solutions are signalling a new era of digital initiatives shifting the focus from building novel functionalities per-se to the introduction of technological capabilities that incorporate and inter-operate with a wide range of existing systems. This kind of situation calls for collective action among diverse public and private actors that need to interact in complex ways to implement and upkeep e-health solutions. Furthermore, technologies are changing today very rapidly, and strategies for effectively managing future evolution are needed.

In this study, we examine the introduction of e-prescription in Norway and Greece as a process towards achieving embeddedness within the existing information systems´ landscape of healthcare. This requires action taking by public sector actors at different government levels and also, by private actors. We used the lens of collective action for informing our investigation. Our analysis brings to focus the mechanisms of making initiatives happen when participants have the freedom to make individual decisions on their contributions structuring their work in the best way they consider fit.

6 REFERENCES

[1] Vassilakopoulou, P., Tsagkas, V. and Marmaras, N. 2012, From “rules to interpret” to “rules to follow”: ePrescription in Greece. *Electronic Journal of e-Government*, 10(2), pp.147-55.

[2] Rodon, J. and Silva, L. 2015, Exploring the Formation of a Healthcare Information Infrastructure: Hierarchy or Meshwork? *Journal of the Association for Information Systems*, 16(5), pp.394-417.

[3] Aanestad, M., Grisot, M., Hanseth, O. and Vassilakopoulou, P. 2017, Strategies for building eHealth Infrastructures. In: Aanestad, M., Grisot, M., Hanseth, O. and Vassilakopoulou, P. eds., *Information Infrastructures within European Health Care: Working with the Installed Base*. 1st ed. London: Springer, pp. 35-51.

[4] World Health Organization. 2010, *The World Health Report. Health systems financing: the path to universal coverage.* Geneva: World Health Organization Press.

[5] Pesaljevic, A. 2016, *e-Prescription Embeddedness in the Norwegian Health Sector*. Master Thesis, University of Oslo.

[6] Hanseth, O. and Bygstad, B. 2017, The ePrescription initiative and Information Infrastructure in Norway. In: Aanestad, M., Grisot, M., Hanseth, O. and Vassilakopoulou, P. eds., *Information Infrastructures within European Health Care: Working with the Installed Base*. 1st ed. London: Springer, pp 73-87.

[7] Vassilakopoulou, P. and Marmaras, N. 2013, Transitions in The Making: Introducing E-Health Platforms In Greece. In: *European Conference on Information Systems - ECIS 2013*. Barcelona: AIS.

[8] Vassilakopoulou, P. and Marmaras, N. 2015, Work practice adaptations within their overall context: investigating technology-induced transitions in healthcare. *Health Policy and Technology*, 4(3), pp.277-85.

[9] Papanikolaou, C. 2013, The Greek EU Presidency's Plans in 2014: eHealth Forum & beyond. In: *3rd EU-US eHealth marketplace and conference*.

[10] Grisot, M. and Vassilakopoulou, P. 2017, Re-Infrastructuring for eHealth: Dealing with Turns in Infrastructure Development. *Computer Supported Cooperative Work*, 26(1), pp.7–31.

[11] Grisot, M. and Vassilakopoulou, P. 2015, The Work of Infrastructuring: A Study of a National eHealth Project. In: *14th European Conference on Computer Supported Cooperative Work - ECSCW 2015.* Oslo: Springer, pp.205-221.

[12] Bietz, M., Baumer, E. and Lee, C. 2010, Synergizing in cyberinfrastructure development. *Computer Supported Cooperative Work*, 19(3-4), pp. 245-281.

[13] Monteiro, E., Pollock, N., Hanseth, O. and Williams, R. 2013, From artefacts to infrastructures. *Computer Supported Cooperative Work*, 22(4-6), pp.575-607.

[14] Fulk, J. and DeSanctis, G. 1995, Electronic communication and changing organizational forms. *Organization Science*, 6(4), pp.337-349.

[15] Heckathorn, DD. 1996, The dynamics and dilemmas of collective action. *American sociological review*, 61(2), pp. 250-77.

[16] Eisenhardt, KM. 1989, Building Theories from Case-Study Research. *Academy of Management Review*, 14(4), pp.532-550.

[17] Eisenhardt, KM. and Graebner, ME. 2007, Theory building from cases: Opportunities and challenges. *Academy of management journal*, 50(1), pp.25-32.

[18] Yin, RK. 2014, *Case study research: Design and methods*. 5th ed. London: Sage publications.

[19] Vassilakopoulou, P. and Grisot, M. 2013, Exploring the concept of architecture in Technology and Organization studies. *36th Information Systems Research Seminar in Scandinavia*. Gran: IRIS Associat