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MANAGING CHANGE USING A SOCIO-TECHNICAL APPROACH: STAFF PERSPECTIVES ON NEW LIBRARY SYSTEM IMPLEMENTATION

Master's Thesis in Governance of Digitalization
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ABSTRACT

Subject: Governance of Digitalization
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Title: Managing change using a socio-technical approach: staff perspectives on new library system implementation
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Abstract: Digitalization has placed new requirements for both the technical architecture and organizational capabilities of information services. This thesis examines library staff perceptions of the implementation of a new library system in Finnish higher education libraries. Diffusion of innovations and social construction of technology literature were applied to study the differences in perceptions between staff groups, the mediating effect of personal innovativeness, and the state of technological frames in the libraries in order to suggest change management practices. The data set of the study was gathered via a questionnaire and was then subjected to a principal component analysis, followed by regression and mediation analyses. Level of education and the staff member's position at the library were both significant predictors of perceived usability. Work experience in the library field correlated negatively with perceived usability. Personal innovativeness was discovered to be a very strong mediating variable between level of education, usability, and trialability. Overall differences between user groups were low, indicating high social cohesion and congruent technological frames. It is suggested that managers focus on identifying and designating innovative employees as change agents regardless of the employee's educational background or current position. Support and training should be provided especially to employees with a lower level of education or longer work experience in libraries.
Keywords: diffusion of innovations, innovation characteristics, personal innovativeness, social construction of technology, change management, libraries, quantitative methods, principal component analysis, regression analysis, analysis of variance, mediation analysis

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1 INTRODUCTION

Digitalization is changing the operational and strategic landscape of both private and public organizations. The access, availability, and application of digital resources is especially important for both users and providers of information services. Libraries have historically been at the forefront of providing the public with access to technological innovations before they were adopted into the mainstream. For example, Finnish public libraries introduced Internet access for patrons as a service in the mid-90's, when household dial-up connections were rather rare and used mostly by early adopters.

Since then, mobile connectivity, digital information resources, and increasing competition between digital services have increased tremendously. This is especially visible in higher education libraries, which often need to provide a large number of users with access to very specific domain knowledge. In Finnish higher education libraries, nearly 12 million electronic books were available in 2018 – in total, that is over 75% of all monographs in these libraries (National Library of Finland, 2020).

While these libraries have oriented themselves towards digital services, the shift to digital resources also places more requirements for the library systems used by the staff to acquire, catalog, and provide access to resources. Library systems are very complex pieces of software: they include not only metadata of information resources, but also sensitive patron data, order and invoice data, operational logic, reporting tools, and often a separate user interface for staff users and patrons. Often, these features are interconnected into other systems both outside and within the libraries' immediate organization. Connectivity with other libraries, ERP systems, vendor systems, and student registries is crucial to reduce the amount of redundant work and data cleanup. Simultaneously, librarians themselves must be able to learn how to cope with changes in both operative workflows and possible larger strategic developments facilitated by new technologies.

This thesis examines the implementation of a new library system in Finnish higher education libraries as a result of the paradigm shift of digitalization. The study is focused on the relationship between the sociodemographic background variables of library staff and the perceptions the staff members have towards using the new system. The objective of the thesis is to analyze potential differences between user groups in order to suggest

practices for change management and identifying groups who may require more support during change processes. The theoretical framework of the study is based on literature of both diffusion of innovations theory and the social construction of technology.

The rest of Chapter 1 introduces the project organization and the context of the implementation project in more detail. Chapter 2 introduces a literature review into innovations, technology adoption, and the social construction of technology. Chapter 3 is focused on research design and methodology. Chapter 4 features an analysis of the results, and Chapter 5 includes discussion on the implications, applications, and limitations of the study.

1.1 The Lumikko project organization

Finnish higher education libraries can be divided into two main categories: university libraries and university of applied sciences libraries. In the early 2000s, both types of libraries set up consortiums for the tendering, acquisition and implementation of a library system and to improve collaboration between libraries: the Linnea2 consortium for university libraries and the AMKIT consortium for polytechnic institution libraries. Both consortia settled on using the same integrated library system, which consisted of several discrete modules for separate library processes such as acquisitions, cataloguing, and circulation. Linnea2 went live with their implementation in 2001, with AMKIT libraries following by the end of 2003. The local system instances for all libraries were hosted on CSC servers in Espoo.

In the early 2010s, increased demand for electronic resources resulted in libraries reassessing the availability for digital resources. Thereafter, the UKJ project was formed to map out the development and implementation of a new library system (Ahlqvist & Kivimäki, 2013). While UKJ did not produce a new system and eventually folded in 2014, the national end user interface Finna was developed to facilitate access to digital materials. Each participating information service can apply for their own Finna instance, with a national Finna catalog aggregating results from each participating organization (National Library of Finland, 2016).

After UKJ, libraries continued to study alternatives for the successor of the library system which had at that point been use for nearly 15 years. Differences between library sizes,

userbase preferences, scientific disciplines in each institution, and internal work processes made it difficult for one solution to fit the needs of every library. Subsequently, it was agreed that the acquisition and implementation successor system would not be tendered on a national consortium level. Instead, two groups emerged: libraries which opted for a SaaS-based commercial library platform product, and libraries which chose an open source library software to build upon, using the existing CSC infrastructure. System customizability, integrations, and maintenance costs were important considerations for both approaches (Keskitalo, 2019).

The group of libraries opting for the SaaS library platform organized themselves into a project group, dubbed Lumikko. The Lumikko libraries functioned as a loose consortium: the tendering procedure covered all the participating libraries, but each system instance would be contracted separately. A total of 26 libraries were involved in the project, with a total of 17 unique library system instances. Due to the size of the project, the Lumikko libraries implemented the new system in two waves. Wave one libraries included Turku University, Åbo Akademi, University of Eastern Finland, Turku University of Applied Science, Karelia University of Applied Sciences, Satakunta University of Applied Sciences, Seinäjoki University of Applied Sciences libraries, and Tampere University Library (a merger between Tampere University, Tampere University of Technology, and Tampere University of Applied Sciences libraries).

Wave two libraries include Helsinki University Library (and other Helka libraries), Library of Parliament, Oulu University Library, Uniarts Helsinki Library, Lapland University Consortium, Jyväskylä University of Applied Sciences, Kajaani University of Applied Sciences, Lahti University of Applied Sciences, Oulu University of Applied Sciences, and Savonia University of Applied Sciences libraries. Throughout the implementation project, Lumikko libraries have collaborated with the National Library of Finland to ensure system compatibility with national metadata services and Finna.

1.1.1 Project timeline and milestones

The first wave of the project began with an onboarding phase in April 2019, during which project groups at libraries acquainted themselves with introductory materials provided by the system provider. Preliminary data cleaning was done at libraries during the late spring and early summer, based on instructions and best practices suggested by both the system

provider and other Nordic libraries using the same library system. Access to a training sandbox with virtual patron and bibliographic data was provided to the libraries in late April 2019, mostly to familiarize staff with the user interface and general features of the system.

For wave one, the implementation period began in July 2019, during which system configuration and migration parameters were defined. A test load from the legacy system to the production environment of the new system was performed in September 2019 for all wave one libraries. After the test load, alterations to the final configuration were made in conjunction with on-site training by the system provider. The bulk of library staff training was held between late November and early December 2019. The final system load was done during the first half of December 2019, eliminating the test data from the production environment and migrating in the latest data from the legacy system. The new system went live on December 23rd, 2019, but most wave one libraries prohibited patron access until the start of January 2020 in order to go through a task list of system check-ups. Switch to support took place at the end of February 2020. Wave two is set to go live in July 2020.

2 PERSPECTIVES INTO INNOVATIONS AND TECHNOLOGY ADOPTION

The word *innovation* has seen widespread use in public discourse throughout the new millennium. In mainstream media, innovations tend to be linked with emergent technologies, economic growth, and sometimes unwarranted marketing hype. The Merriam Webster dictionary defines innovation rather broadly as "the introduction of something new" (Merriam-Webster, 2020). In contrast, Everett M. Rogers defined innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers, 2003, 12). The distinction is not only semantic: Rogers postulated that innovation is a subjectively experienced entity, as perceived by the unit of adoption. A similar definition by Van de Ven regards innovation as "…a new idea which may be a recombination of old ideas, a scheme that challenges the present order, a formula, or a unique approach which is perceived new by the individuals involved" (Van de Ven, 1986). Innovations have also been described as complex, non-linear processes, which are influenced by the interplay of other innovations, societal trends, and individual preferences (Kline, 2009).

These assertions imply that innovations do not manifest out of thin air or a production line to be readily adoptable, but are subject to a complex course of social, cultural, political, and ideological deconstruction and reconstruction before eventual adoption or rejection may take place. These processes will be introduced in more detail in this chapter.

2.1 Technological determinism, social constructionism, and socio-technical approaches

The paradigm of innovation and technology adoption studies has shifted profusely over past decades. Initial innovation studies in the 1950s and 1960s were largely based on the perspective that technology itself determines the course an organization will take in developing its processes and operations (Banker & Kauffman, 2004). This perspective follows in the tradition of social scientists such as Thorstein Veblen, who considered technology to be the driving force behind ushering humanity into new eras from the stone age to the industrial revolution and beyond. Veblen saw technology as the main antecedent for capitalism stabilizing as an economic system in industrial countries, with

further technological advancements perpetuating this stabilization (Papageorgiou & Michaelides, 2016).

The technological determinism paradigm was eventually challenged, giving way to the social constructionist and actor-focused views into innovation and technology adoption research. This can be observed as early as in the early 1970s in the writings of organizational theorists such as Rosemary Stewart, who noted that in some cases computerization resulted in extra work for managers as opposed to convenience and task automation. Stewart hypothesized this to be the result of more layers of influence within an organization besides technology itself (Stewart, 1971). This change of focus happened concurrently with similar larger trends in IS research. Personal computing technology changed many workplaces throughout the 1980s, and subsequently the individual or "user" became the main unit of study (Banker & Kauffman, 2004). Famous examples of this paradigm are Fishbein and Azjen's Theory of Reasoned Action (TRA) and Davis' Technology Acceptance Model (TAM), both of which have since undergone various revisions. These theories aim to predict adoption based on attitudes towards behavior and perceptions towards usefulness and ease of use, respectively (Davis, 1989; Fishbein, 1975). While widely cited in IS literature, these theories have also come under scrutiny due to focusing heavily on individual actors while neglecting the wider social context in which these actors operate (Laurila & Preece, 2003). This is especially true in an organizational context, where social networks and power relationships between actors present a strong impetus for technology adoption or rejection (Burkhardt & Brass, 2016).

Post-structuralist research approaches have emerged to offer a hybrid perspective into diffusion and adoption. These socio-technical views attempt to strike a balance between the materiality of technological determinism studies and the holistic viewpoint of social constructionism. Instead of favoring either technology or social context as an independent variable towards one another, a socio-technical approach sees the innovation process as a complex structure of technological artifact characteristics and individual preferences which in turn are governed by a wider socio-technical frame (Flichy, 2007, 165). This has implications for organizational adoption studies: as each organization is different, synthesizing a general model for organizational technology adoption may prove to be a fool's errand. However, a hybrid socio-technical angle may provide insight into the inner mechanisms and intangible assets of an organization such as human capital,

communication networks, capabilities, and the transformation of these elements over time (McLoughlin & Dawson, 2003).

2.2 Innovation as a driver for change

While a multitude of approaches to innovation research exist, it can also be argued that the innovation itself consists of many layers, some of which are more prone to external social configurations than others. As such, a single research paradigm may not be able to cover the entirety of the innovation. To illustrate this, Frank W. Geels presents a lifecycle model of innovation, based on his earlier work on technological transitions (Elzen, Geels, & Green, 2004, 38). In this chapter, the new library system in deconstructed in accordance with the model to provide a scope for where the study of its innovation characteristics lies in the integrated multi-level view.

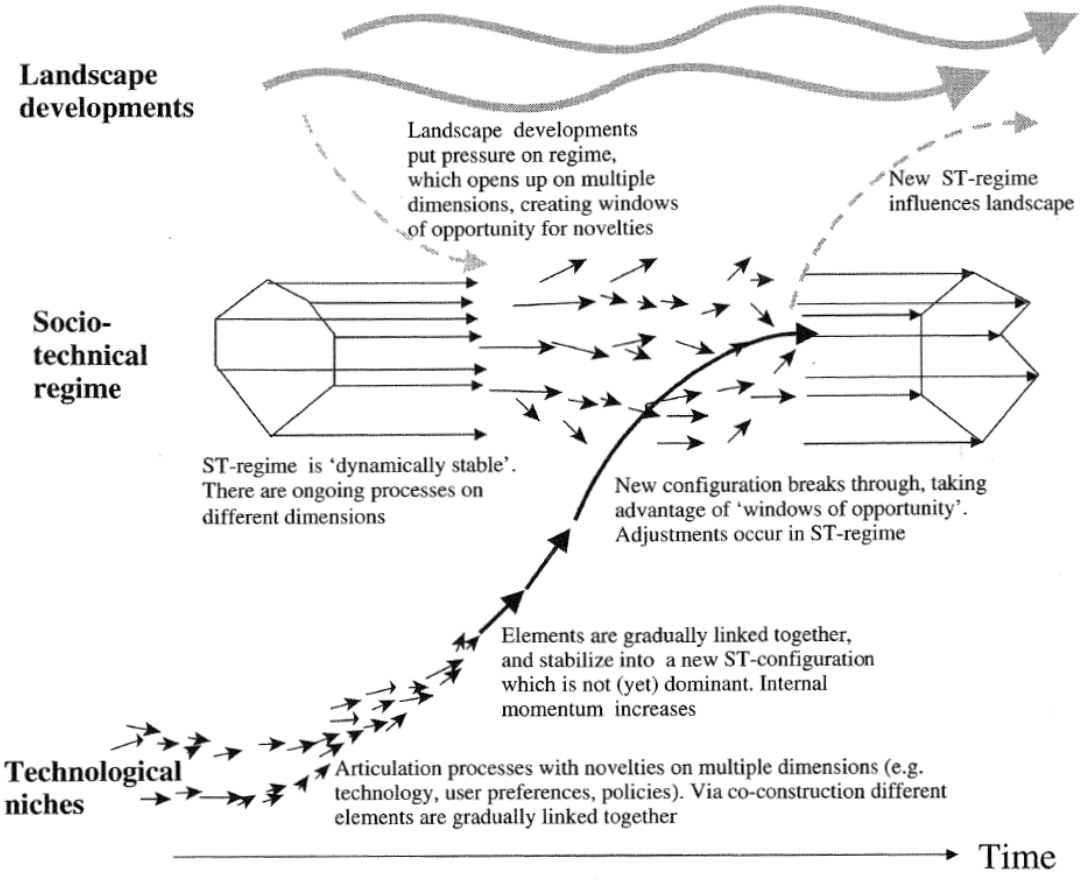

Figure 1 A dynamic multi-level perspective on system innovation (Geels 2004).

Geels contends that the innovation process is initiated by radical novelties or incremental changes to existing technologies, ideas, and practices. In the case of the new library system, the technological niche includes both the existing library system and the social groups involved in creating, using, and distributing the system. Innovation can thus be initiated by any of these characters or, most commonly, as a result of the interplay between them (Elzen et al., 2004). At first separate and disjointed, these novelties can be considered as singular system innovation elements. In the case of a new library system, these incremental innovations can involve new workflows, APIs to other systems, metadata repositories, etc. These individual processes then converge into a single configuration. In this case, the configuration is the new library system as a product, containing all the articulation processes in a single package.

The new configuration is then introduced into the existing socio-technical regime. The introduction is dependent on a window of opportunity emerging from the regime to adopt the innovation. The consortium of Lumikko libraries can thus be considered a socio-technical regime. The new artifact engages in competition with the values, perceptions, and attitudes of the present regime. The window of opportunity is influenced by macro-level landscape developments. For Lumikko libraries, the landscape includes both their immediate surrounding organizations and the Finnish society. For example, a government policy to alter university funding may cause changes to the proceedings of individual units within universities, such as libraries.

The landscape also includes the expansive sociocultural and technological environment in which the organization operates. Digitalization has enabled a new paradigm of self-efficacy in the availability of information, where user needs have become much more demanding and specialized. Responding to this change is especially important for memory organizations such as libraries, as alternative channels to obtain information have become more frequent (Moran, 2013, p. 45). The change management process for Lumikko libraries can be perceived as a response to these landscape changes. This response in turns triggers another, internal wave of change within the Lumikko libraries. For internal change, employee empowerment, buy-in, participatory culture, and choosing suitable change agents are imperative. Change agents should listen to and observe the employees' worries regarding change, while simultaneously instructing them to question

the status quo of the organization and discover areas of improvement (Moran, 2013, p. 53).

2.3 Social construction of technology

The hybrid approach presented in the previous sub-chapter has been outlined by Bijker in his conceptual framework for the social construction of technology (SCOT). While some studies make a semantic distinction between Bijker's earlier and latter revisions of the framework with the respective acronyms SCOT and SCOT2, this thesis only refers to the newer revision using the acronym SCOT for consistency and readability. Bijker endeavored to establish SCOT as a generalized theory of technological development (Bijker, 1995, p. 13). In order to establish this, SCOT recognizes relevant social groups, interpretive flexibility, and technological frames as concepts of interest.

2.3.1 Relevant social groups and interpretive flexibility

According to SCOT, relevant social groups are groups of actors who are connected by a shared perception of the problems and possible solutions that can be provided by a technological artifact (Bijker, 1995, p. 50). In the Lumikko project, three major social groups can be readily observed: the librarians migrating into a new system, the library system provider, and the library patrons. Each of these groups has a different set of problems, and the artifact of the library system is a possible solution to those problems. For the system vendor, an example of a problem is increased competition in the SaaS market: vendors cannot control their clients' switching costs, making service quality and functionality paramount (Ma & Kauffman, 2014). As an example of a solution related to this problem, the new library system offers robust REST API functions to transfer data objects between the library system and 3rd party systems such as ERP systems, student registries, and vendor purchasing systems. This enables the system to interface with various configurations in different organizations, which in turn provides a solution to a client-side problem: staff in the Lumikko libraries required new tools to streamline workflows, harmonize and consolidate systems, and lower operating costs.

However, focusing solely on what is immediately observable neglects those actors within the social groups who may be unable to voice their opinion due to organizational power structures or mis- or underrepresentation (Bijker, 1995, p. 49). For instance, it is

disingenuous to portray librarians as a single homogenous unit, wherein all actors share an identical problem-solution paradigm. Nevertheless, organizations are often used as the unit of analysis without consideration for the differences in their employees' attitudes (Green, Wu, Whitten, & Medlin, 2006).

2.3.2 Technological frames

When the interpretive flexibility of an innovation decreases, a single interpretation of the innovation becomes its de facto representation. Bijker refers to these processes as closure and stabilization. Essentially, one social group's perception becomes the de facto meaning for the artifact. Orlikowski and Gash suggested the notion of *technological frames* as a conceptual framework for studying the socio-cognitive processes towards technological artifacts. These include assumptions, expectations, and knowledge towards technology that are held by a certain social group or community (Orlikowski & Gash, 1994). Their approach was not entirely novel, as similar phenomena has been described with concepts such as *interpretive frames*, *mental models*, and *paradigms* in cognitive psychology. Orlikowski and Gash argue that technological frames are implicit sense-making and decision-making devices in organizations. If several incongruent frames exist within an organization, it may impede the introduction of new technological innovations. Conversely, congruent technological frames assist the dissemination and adoption of technology. Bijker attests that the success of an innovation is dependent on several congruent frames coming together, with one group enrolling others into supporting it (Bijker, 1995, pp. 277–278). In conclusion, it should be noted that technological frames are essentially a social process – not existing within individuals, but rather constructed at the level of a social group by its members (Bijker, 1995, p. 193).

2.4 Innovation characteristics

Rogers suggests a set of measurable innovation characteristics as a method of predicting the rate of innovation adoption on an individual or organization level. The innovation characteristics approach emphasizes the influence of subjective factors on behavior towards innovations, such as previous experiences and behavioral norms. Rogers asserts that a majority of variance in the rate of innovation adoption can be explained by five

innovation characteristics: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003, 223).

Relative advantage

Relative advantage refers to the degree in which the subject believes the innovation to be an improvement over the idea or product which preceded it (Rogers, 2003, 231). As a construct, relative advantage bears a resemblance to the concept of Perceived Usefulness in Davis' Technology Acceptance Model (TAM) (Davis, 1989). Both constructs have been criticized for being too general, as perceptions of advantage can be highly subjective: easier task management, improved status among peers, and economical factors are all similarly valid examples of perceived relative advantage or usefulness. To counter this, an innovation's perceived effect on its user's social status is often separated into its own construct. In developing their highly influential instrument for measuring perceived innovation characteristics, Moore & Benbasat suggested the additional innovation characteristic of *image* to assess these perceptions (Moore & Benbasat, 1991).

Rogers generalized relative advantage to be positively correlated with innovation adoption rate (Rogers, 2003, 233). This hypothesis has been largely supported by a great number of studies. A 2014 meta-analysis of over 200 studies utilizing the innovation characteristics approach found relative advantage to be a statistically significant antecedent to both adoption and intention to adopt an innovation (Kapoor, Dwivedi, & Williams, 2014).

Compatibility

Compatibility can be described as the degree in which an innovation is perceived as consistent by the values, past experiences, and needs of the user. As such, compatibility is highly influenced by behavioral norms on a societal or organizational level in addition to individual attributes (Rogers, 2003, 240). As with relative advantage, the construct of compatibility has attracted criticism: in developing their instrument, Moore & Benbasat considered user needs to be a component of relative advantage, as opposed to compatibility (Moore & Benbasat, 1991). Subsequently, studies built around the Moore & Benbasat instrument measure compatibility as the aggregate of sociocultural values

and previously introduced ideas contributing towards perceptions of an innovation. However, the common practice of reusing measurements scales in innovation studies has also resulted in a trend of compatibility being utilized as a catch-all term for "suitable with one's methods of work" while diminishing the contribution of social antecedents influencing compatibility (Van Slyke, Johnson, Hightower, & Elgarah, 2008). Rogers hypothesized compatibility to correlate positively with rate of adoption, and this hypothesis has been supported to a significant degree in studies measuring innovation characteristics (Kapoor et al., 2014).

Complexity

Complexity is the degree to which an innovation is perceived as difficult to understand and use (Rogers, 2003, p. 257). As with relative advantage, the construct can be viewed as a counterpart to the similar concept of Perceived Ease of Use in TAM (Davis, 1989). While Rogers regarded complexity to be less significant of a predictor for rate of adoption than relative advantage and compatibility, past studies have indicated that increased complexity is negatively correlated with intention to adopt (Kapoor et al., 2014). While personal innovativeness in information technology (PIIT) has been observed to moderate Perceived Ease of Use in technology acceptance studies (Jackson, Yi, & Park, 2013; Amoroso & Lim, 2015), the connection between PIIT and perceived complexity is far less studied.

Trialability

Trialability is the degree to which the innovation is available for testing, experimentation, and familiarization before a decision to adopt or reject is made (Rogers, 2003, p. 258). Rogers theorized a positive link between trialability and rate of adoption. Most studies involving trialability have been predictive in nature, in contrast to the more common retrospective method of examining perceived innovation characteristics and adoption (Kapoor et al., 2014). For the purposes of this study, the construct of trialability will focus on the period of testing done on the new system's sandbox during the implementation phase.

Observability

Observability refers to the degree to which the results of using an innovation are visible and communicable to others (Rogers, 2003, p. 258). Moore & Benbasat problematized this approach and argued that this construct measured two separate dimensions: the degree to which the results of using an innovation are tangible and communicable, and the degree to which using the innovation is literally visible for the individual in their environment, such as seen in use by their colleagues (Moore & Benbasat, 1991). This deconstruction resulted in the respective constructs of *result demonstrability* and *visibility*.

Voluntariness

While voluntariness was not considered by Rogers to be an innovation characteristic per se, he theorized the existence of several categories of innovation-decision types which would factor into the rate of adoption. Rogers identified three main innovation-decision types (Rogers, 2003, p. 403):

- *Optional*: the decision to adopt or reject an innovation is dependent on the individual's choice.
- *Collective*: the decision to adopt or reject an innovation is made in consensus by members of a system, after which all members are expected to act according to the decision.
- *Authority*: the decision to adopt or reject an innovation is made by a relatively small number of people with influence and power, and those lower in the power hierarchy are expected to comply.

Additionally, Rogers introduced *contingent* innovation-decision types as decision processes which include two or more outcomes in a sequence, with later decisions in the sequence being dependent on the earlier decisions (Rogers, 2003, p. 403). In a modern information workplace setting, individual employees are commonly mandated to use specific innovations or systems from above.

The Lumikko project organization's decision to adopt the new library system can be perceived as a contingent innovation-decision: in the planning stages, representatives of the libraries congregated to make a collective decision to adopt the new system. These

libraries in turn would introduce the new system to their employees, conforming to the authoritarian innovation-decision type.

Moore & Benbasat concluded that even if the decision to adopt an innovation is mandated from above, there are gradients to individual levels of perceived voluntariness. Accordingly, the construct of voluntariness was itemized in their instrument (Moore & Benbasat, 1991).

2.5 Innovativeness as a personal attribute

The degree to which individuals themselves are relatively earlier to adopt innovations than other members of their system has similarly been a subject of study. Even the early adoption studies distinguished individual characteristics such as metropoliteness and higher levels of education as early adopter traits (Deutschman & Borda, 1995).

Models such as TAM present individual attitudes as a mediating variable between perceived usefulness, ease of use, and intention to use a technology. While this approach accounts for individual affect, it fails to provide insight as to how these attitudes are formed. Agarwal and Prasad presented the idea of appropriating the concept of personal innovativeness from previous diffusion and social psychology literature and instrumentalizing it for use in an information technology context (Agarwal & Prasad, 1998). The resultant construct was titled *personal innovativeness in information technology* (PIIT). Agarwal and Prasad introduced four items to measure the degree of PIIT, and suggested its use in examining the moderating and mediating effects of PIIT on information technology use (Agarwal & Prasad, 1998).

The PIIT concept differs from other commonly used user-administered assessments in that it does not measure self-efficacy, ie. the individual's perception on whether they are adept at using an information technology. Instead, PIIT focuses on the individual's willingness to engage and experiment with new information technology. It can be argued that despite its subjective nature, PIIT may in fact provide a more comparable result of individual attitudes towards information technology than self-efficacy constructs due to respondents often under- or overestimating their levels of self-efficacy (Keil, 2002).

2.6 Criticism of innovation studies

Diffusion of innovation theory has also been the target of scrutiny, especially since the 2000s onwards. Fougère and Harding argue that the concept of "diffusion" naturalizes innovation as something innately positive and progressive which is delivered from the Western world into the "less developed non-West" (Fougère & Harding, 2012). The assertion is that innovation itself is the product of Western academia, and as such its diffusion cannot be studied on universal terms but rather on a sociocultural level. Even during the Enlightenment, innovators were considered dissidents and opponents of the current governing institutions. It took until the 20th century to herald innovation as a relational concept to creativity and originality in scientific literature (Godin, 2012).

Another aspect of criticism for innovation studies has been their tendency to ignore the negative consequences of innovations. Innovation studies often focus on organizations as the level of analysis, instead of individual employees. The general perspective of these studies is that innovations categorically improve the employees' well-being and work performance, even though change affects each individual on a different scale – for some, it may cause a great deal of stress. The degree of autonomy and control over an individual's work has been found to be related to their position at the organization, with employees reporting more negative effects than managers (Cañibano, Basilio, & Sánchez, 2012).

3 RESEARCH DESIGN

While the relationship between perceived innovation characteristics and intention to adopt has been widely studied, the correlations between sociodemographic variables and perceived innovation characteristics in an organizational setting have been subject to less academic inquiry. Similarly, organizational adoption studies tend to forego the subjective experience of voluntariness in examining mandated adoption (Gallivan, 2001). This study suggests an approach where both personal innovativeness and sociodemographic background variables are utilized as potential predictors of perceived innovation characteristics. These perceptions can then be analysed in an organizational (or rather, consortium-wide) context to possibly identify various types of users in an effort to tailor change management practices towards these user types. The three research questions are as follows:

RQ1: How do sociodemographic variables predict perceived innovation characteristics?

RQ2: Does personal innovativeness have a mediating effect on perceived innovation characteristics?

RQ3: Based on the data, what inferences can be made of the state of interpretive flexibility and technological frames in participating Lumikko libraries?

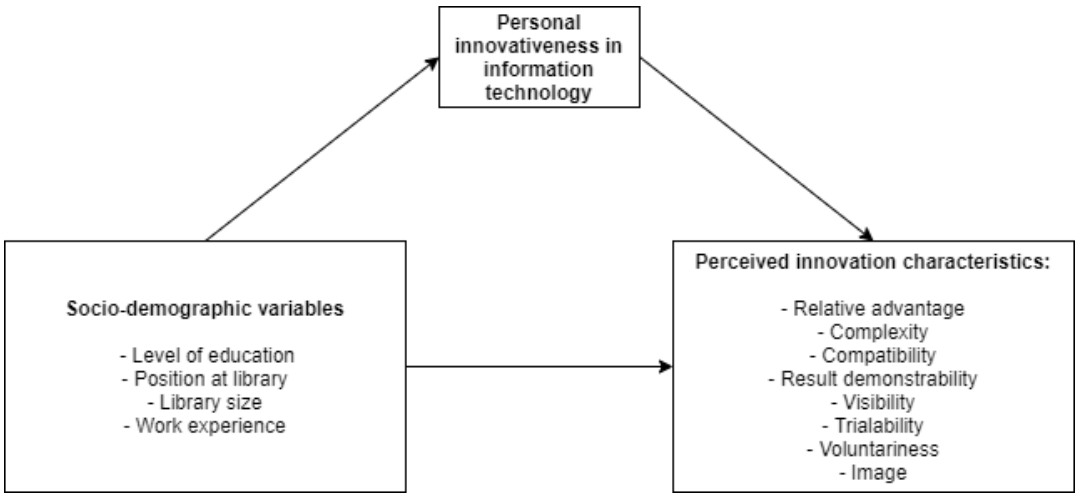

Figure 2 Conceptual research model

Building upon the literature review, four sociodemographic background variables are used as independent variables. Rogers generalized that individuals with higher levels of education and socioeconomic status have more contact with change agents, and thus are more innovative (Rogers, 2003, p. 308). Additionally, Rogers asserted that the level of "metropoliteness" exhibited by an individual is positively correlated to their degree of opinion leadership (Rogers, 2003, p. 317). As such, the level of education and current position in the library were included in the research design. The amount of years spent working as a librarian is included as a measure of experience, since experienced and inexperienced users have been observed to perceive innovation characteristics differently (Liao & Lu, 2008). While organization size alone has not conclusively been found as a predictor of IT adoption, it is often contingent on moderating variables (Lee & Xia, 2006). Due to this, the distinction between small-to-medium size libraries and large libraries is used in this study.

Age and gender were initially considered for inclusion as demographic variables. However, the literature review provided conflicting results on the actual influence of these variables. Some studies found them statistically significant (Ilie, Van Slyke, Green, & Lou, 2005; Teo & Lim, 1996), while others did not (Chung, 2014; Kademeteme & Twinomurinzi, 2019). It could also be argued that gender as a variable is highly subjective to landscape developments, such as the level of gender equality in the location where the study takes place. Furthermore, the inclusion of such personal data could have jeopardized respondent anonymity, especially in smaller libraries.

In order to provide answers for the research questions, a two-tiered research methodology is applied. The first tier of analysis involves a principal component analysis utilizing data from a questionnaire built around measuring Rogersian innovation characteristics and personal innovation. PCA was chosen as the method of analysis due to Rogers' assertion that each innovation should be examined as its own entity, with reservations towards standardized measurement instruments (Rogers, 2003, p. 225). The choice was also informed by the criticism leveled at diffusion studies in Chapter 2.6: as the focus of the study is on differences between groups of individuals, it was considered important to question the standardized instrument often used in organizational innovation studies. The second tier of analysis consists of an analysis of variance (ANOVA) with sociodemographic variables as independent variables and the latent variables as

dependent variables. The main measure of interest is the *effect size*, referring to the amount of variance explained by the relationship between variables (Singh, 2007).

3.1 The questionnaire

The questionnaire was initially modeled after the aforementioned Moore & Benbasat instrument. However, some individual items were altered in phrasing, wording, or general content. This approach was supported by Rogers' assertion of innovation attributes varying on a case-by-case basis, necessitating some level of tailoring for individual items (Rogers, 2003, 225). During the literature review, a sample of 30 studies utilizing Rogersian innovation characteristics as dependent variables were examined for their item wording and content (Appendix A).

The most notable itemization changes were done on items measuring the compatibility construct. Only one item measuring work task compatibility was used, with the addition of one item measuring compatibility with personal values and one item measuring compatibility with organizational values. This emphasis on social compatibility was based on criticism towards the Moore & Benbasat instrument, as exemplified in chapter 2.4.2. None of the 30 studies examined for the questionnaire included items measuring social compatibility as part of the compatibility construct, further reinforcing this decision. In addition to the Rogersian variables, the construct of personal innovativeness was itemized in accordance to the Agarwal and Prasad PIIT concept.

The final instrument consisted of 4 background questions and 26 items representing 9 constructs (Appendix B). Because the background questions involved indirect personal information, a privacy notice was included in the questionnaire to inform the participants of how the data was going to be used. The items were measured on a 5-point bipolar Likert scale measuring from 1 (disagree completely) to 5 (agree completely). While a 7-point scale is sometimes applied for more granularity, for the purposes of this study a 5-point scale was considered sufficient. This was done to counter respondent confusion in regards to vague quantifiers, especially since the measured constructs were rather abstract in nature (Dillman, 2014). For the same reason, no reverse scale items were used in the questionnaire. As the majority of the population was Finnish speaking, the questionnaire items were translated into Finnish. The Language Center was consulted during the translation process to ensure that construct validity remained intact.

The questionnaire was administered via a Google Forms survey, which was open to responses for 2,5 weeks between February and March 2020. The link to the questionnaire was distributed to the project managers in each of the 8 participating libraries in the first implementation wave of the new library system, who in turn distributed the questionnaire within their respective organizations. The total population of the study was approximately 330 library employees, based on 2018 statistical data on higher education libraries (KITT 2020).

4 ANALYSIS

A total of 97 responses were collected via the online questionnaire. The resulting dataset had no missing values, as submitting the questionnaire required an input for each item. Data analysis was performed in IBM SPSS 25. All testing was done using a significance value of $\alpha = 0.05$.

Level of education				
		Frequency	Valid Percent	Cumulative Percent
Valid	Secondary education	10	10.3	10.3
	Bachelor's degree	24	24.7	35.1
	Master's degree	59	60.8	95.9
	Doctoral degree	4	4.1	100.0
	Total	97	100.0	

Table 1 Frequency distribution of level of education in respondents

Over 60 percent of respondents reported a master's degree as their highest level of education. Approximately a quarter of respondents reported a bachelor's degree, ten percent of respondents a secondary education and four respondents held a doctoral degree.

Position at library				
		Frequency	Valid Percent	Cumulative Percent
Valid	Employee	37	38.1	38.1
	Expert	51	52.6	90.7
	Manager	9	9.3	100.0
	Total	97	100.0	

Table 2 Frequency distribution of position at library in respondents

Slightly over half of the respondents were in expert positions in their respective libraries, with employees being represented by a 38 percent proportion. In total these two categories made up over 90 percent of the responses, with the remaining 9.3 percent consisting of manager responses.

Library size (in number of staff)				
		Frequency	Valid Percent	Cumulative Percent
Valid	Small or medium	22	22.7	22.7
	Large	75	77.3	100.0
	Total	97	100.0	

Table 3 Frequency distribution of library size, as reported by respondents

Out of all the responses, 22 were from employees of small to medium sized libraries (under 30 employees) and 75 were from employees of large libraries (over 30 employees).

Figure 3 Frequency distribution of respondents' work experience in the library field measured in years

The work experience of respondents in the sample (N = 97) approached a normal distribution, with a sample mean value of $\overline{x}$ = 19.39 years and sample standard deviation of s = 10.67 years spent working in libraries.

4.1 Principal component analysis

Principal component analysis (PCA) is an exploratory statistical procedure which aims to reduce a larger number of total variables into smaller components. It is commonly used to test out questionnaire items and deducing whether multiple quantitative variables represent the larger constructs that they are intended to measure. The function of the procedure is to find solutions which explain the largest amount of variance in the data.

These solutions are then arranged into constructs in order of magnitude of explained variance. The constructs are commonly called *factors* (Keho, 2012).

First, the questionnaire scales representing constructs were examined for internal consistency. The intention of the procedure was to estimate reliability of scales, in other words confirming that the individual items in a group are measuring the same phenomenon. This measure of reliability is often gauged by a coefficient known as Cronbach's alpha, with higher values representing stronger reliability (UCLA, 2020).

Construct	Cronbach's alpha	No. of items in scale
Relative Advantage	0.91	4
Complexity	0.88	4
Personal Innovativeness	0.86	4
Compatibility	0.79	3
Result Demonstrability	0.74	3
Image	0.70	2
Trialability	0.58	2
Visibility	0.47	2
Voluntariness	0.47	2

Table 4 Initial results of scale reliability testing

While several interpretations of acceptable alpha values exist, in social sciences alpha values larger than 0.6-0.7 are generally considered viable (Tavakol & Dennick, 2011). The scales used to measure trialability, visibility, and voluntariness fall short of this limit and were thus omitted from subsequent statistical tests. It should be noted that Cronbach's alpha is sensitive to changes in the size of item scale, with alpha increasing in tandem with the number of items in the scale (Akrout, 2018). Due to this, scores from these three scales will be examined in terms of general descriptive statistics in Chapter 4.4.

4.1.1 Initial PCA

The first PCA was performed with a total of 20 items, after the items measuring trialability, visibility, and voluntariness were omitted. Based on the literature review (Kapoor et al., 2014), it was assumed that the latent variables would have at least some level of correlation with one another. Due to this, a rotation was used in the initial PCA. Essentially, rotational methods aim to discover the simplest possible solution in the data to explain the maximum amount of variance (Brown, 2009). Rotational methods fall into two main categories: *orthogonal* methods assume no correlations between factors, while

oblique methods assume a correlation between factors. For this study, the oblique promax rotation was used.

Communalities		
	Initial	Extraction
RA1	1.000	0,791
RA2	1.000	0.712
RA3	1.000	0.772
RA4	1.000	0.586
CX1	1.000	0.677
CX2	1.000	0.660
CX3	1.000	0.715
CX4	1.000	0.595
CO1	1.000	0.748
CO2	1.000	0.478
CO3	1.000	0.573
RD1	1.000	0.669
RD2	1.000	0.772
RD3	1.000	0.626
IM1	1.000	0.742
IM2	1.000	0.704
PIIT1	1.000	0.714
PIIT2	1.000	0.786
PIIT3	1.000	0.780
PIIT4	1.000	0.695
Extraction Method: Principal Component Analysis.		
Rotation Method: Promax with Kaiser Normalization.		

Table 5 Communality coefficients of initial PCA

The communalities table is used to observe possible outlier variables. The extracted communalities represent the estimate of variance in the component which is explained by each individual item. All values in the table are considered acceptable, variables with extraction values in the 0.2-0.3 region or lower are recommended for deletion (Child, 2006).

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.802	39.012	39.012	7.802	39.012	39.012
2	2.827	14.134	53.146	2.827	14.134	53.146
3	1.806	9.028	62.174	1.806	9.028	62.174
4	1.360	6.799	68.972	1.360	6.799	68.972

Table 6 Extracted components with an Eigenvalue > 1

The initial PCA discovered 4 components with an Eigenvalue greater than 1. Eigenvalue is representative of the total amount of variance in the entire data that is explained by the component. Any component with an Eigenvalue > 1 explains more variance than a single observed variable (Keho, 2012). In total, the four components explained nearly 70 percent of variance in the observed variables, which is above the suggested threshold of 60 percent for meaningful analysis (Hair, Black, & Babin, 2017).

Pattern Matrix[a]				
	Component			
	1	2	3	4
RA1	0.962			
RA2	0.893			
RA3	0.988			
RA4	0.835			
CX1	0.651			
CX2	0.705			
CX3	0.814			
CX4	0.450			
CO1	0.730			
CO2	0.564			-0.329
CO3	0.667			-0.335
RD1	0.396		0.556	
RD2			0.893	
RD3			0.873	
IM1				0.835
IM2				0.837
PIIT1		0.814		
PIIT2		0.872		
PIIT3		0.823		
PIIT4		0.848		
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.				
a. Rotation converged in 5 iterations.				

Table 7 Initial factor loadings of observed variables, only coefficients larger than 0.3 are presented.

Next, the pattern matrix was studied to observe the correlation coefficients between each observed variable and the components. Interestingly, examining the initial factor loadings suggests the presence of a single construct explaining for relative advantage, complexity, and to a degree, compatibility. Additionally, items on the compatibility scale which were intended to measure compatibility with values loaded to the same construct as items measuring perceived image. Item RD1 cross-loaded onto two components.

The heavy loadings on a single factor were considered indicative of collinearity in the data. Collinearity is a result of observed variables being highly correlated with other: in other words, the individual items may be measuring the same thing. Collinearity was

identified by examining the determinant value of the correlation matrix. The determinant can be calculated as the product of all Eigenvalues extracted from the data (Appendix C). The determinant value was 7.828E-7, which was smaller than the necessary value of 0.00001 (Field, 2005).

4.1.2 Final PCA

Further steps were taken to improve both factor loadings and the determinant value. The cross-loaded variables were removed. However, even after this the determinant value was below the acceptable level at 8.212E-6. Another adjustment was thus made by removing the variable with the lowest factor loading, this being CX4 with a correlation coefficient of 0.45. This change yielded a determinant value of 2.189E-5, which was above the required determinant threshold. This adjustment also improved the total variance explained by the model from approximately 69 percent to nearly 74 percent. After these modifications, the pattern matrix identified four clearly separate constructs.

Pattern Matrix[a]				
	Component			
	1	2	3	4
RA1	0.941			
RA2	0.886			
RA3	0.947			
RA4	0.835			
CX1	0.677			
CX2	0.722			
CX3	0.799			
CO1	0.743			
RD2			0.823	
RD3			0.921	
IM1				0.849
IM2				0.895
PIIT1		0.830		
PIIT2		0.853		
PIIT3		0.819		
PIIT4		0.868		

Table 8 Final factor loadings of observed variables, only coefficients larger than 0.3 are presented

Items from the relative advantage, complexity, and compatibility scales still loaded onto a single factor. This is in stark contrast to Moore & Benbasat's findings, where these domains were clearly distinguishable from one another. For this study, this factor is subsequently referred to as *user-perceived usability.* This definition was inspired by the taxonomy presented by McGee et al, (McGee, Rich, & Dumas, 2004) in which user

perceptions are separated into domains of usability and satisfaction qualities. The usability taxonomy includes traits such as “beneficial for problem solving”, “easy to learn”, and “expected”, which are analogous to the Rogersian characteristics of relative advantage, complexity, and compatibility. Personal innovativeness, result demonstrability, and image can clearly be distinguished as their own factors in the matrix. The new scale of usability was once again subjected to reliability testing.

Construct	Cronbach's Alpha	No. of items
Perceived Usability	0.93	8
Personal Innovativeness	0.86	4
Image	0.70	2
Result Demonstrability	0.69	2

Table 9 Final results of scale reliability

The new scale provided improved reliability. The model was then tested for sampling adequacy and significance.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.828
Bartlett's Test of Sphericity	Approx. Chi-Square	963.850
	df	120
	Sig.	0.000

Table 10 Final results of sampling adequacy and significance testing

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is a composite score of the proportion of variance in the variables which might be explained by underlying factors. The score can be interpreted as the viability of the data set to be used in a factor analysis As a general guideline, the KMO value should be at least 0.6 with greater values displaying improved sampling adequacy (Chan & Idris, 2017). Bartlett’s Test of Sphericity tests for correlations between variables for general factor analysis compatibility. The sample passes the test, as this figure is well below the .05 significance level (SPSS only displays the first three decimals in the results window).

Finally, the correlations between the factors themselves were examined to ensure that a proper type of rotation was applied.

Component Correlation Matrix				
Component	1	2	3	4
1	1.000	0.232	0.432	-0.041
2	0.232	1.000	0.202	0.036
3	0.432	0.202	1.000	-0.146
4	-0.041	0.036	-0.146	1.000

Table 11 Final correlation coefficients between factors

As seen in the matrix, a moderate correlation exists between factor 1 and factor 3. Correlation values above 0.32 in the data suggest that the components are sufficiently correlated for an oblique rotational method (Brown, 2009). This validates the use of an oblique promax rotation for the data set. After passing these tests, it was concluded that the factors derived from the data set would be suitable for ANOVA and regression analysis. For these analyses, four new composite scores for the factors were computed using the mean values from responses to items in each scale: usability, personal innovativeness, result demonstrability, and image.

4.2 ANOVA and regression analysis

ANOVA refers to a set of statistical techniques which are used to measure differences between the mean values of groups and the effect size of these differences (Geert van der Berg, 2020) . ANOVA allows the use of categorical variables such as level of education as variables in regression analysis. Regression analysis is a method which examines the relationship between a dependent variable and one or more independent variables. Satisfactory regression models can be used to predict changes in the dependent variable by altering the independent variable's parameters (Anderson & Sweeney, 2020).

ANOVA testing assumes that the residual terms of the variables are normally distributed. Residuals refer to the difference between the observed value and the predicted value of the variable (Anderson & Sweeney, 2020). In other words, it can be described as the distance between the observation and the regression line. The four composite mean factors were subjected to normality testing. The dependent variables were standardized to examine normality through histograms.

It should be noted that according to the central limit theorem, sample sizes over 30 trend increasingly towards normality (Klaubert, 2015). Normality tests are thus more appropriate for smaller sample sizes. With the except of the image factor, all the

dependent variables displayed a normal distribution (Appendix D). The image construct was nevertheless included in testing, however perceptions on image will be discussed more in terms of general descriptive statistics.

4.2.1 Level of education

The highest level of education reported by the respondents was divided into four categories: secondary education, bachelor's degree, master's degree, and doctoral degree. As level of education is a categorical variable, it was dummy coded to enable one-way ANOVA testing. Dummy coding refers to the process of creating new dichotomous variables based on the existing categories of the observed variable. Level of education was coded in the following manner:

	Dummy variables		
	Bachelor's degree	**Master's degree**	**Doctoral degree**
Level of education	1	0	0
	0	1	0
	0	0	1

Table 12 Dummy coding for the level of education variable.

If all values are 0 for any specific observation, the baseline value (secondary education) will be assigned. After dummy coding, the ANOVA test was performed.

	Dependent variable: Perceived usability			**Dependent variable: Result demonstrability**		
Level of education	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	2.413	0.260	0.000	2.850	0.283	0.000
Bachelor's degree	0.707	0.310	**0.025**	0.692	0.337	**0.043**
Master's Degree	0.452	0.281	0.112	0.599	0.306	0.053
Doctoral degree	1.150	0.487	**0.020**	0.775	0.530	0.147
	Dependent variable: Image			**Dependent variable: Personal innovativeness**		
Level of education	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	1.650	0.293	0.000	2.650	0.280	0.000
Bachelor's degree	0.121	0.348	0.729	0.694	0.334	**0.040**
Master's Degree	0.028	0.316	0.930	0.842	0.303	**0.007**
Doctoral degree	0.475	0.547	0.388	-0.212	0.525	0.686

Table 13 One-way ANOVA test results for level of education. Differences under the significance level ($p < 0.05$) are highlighted in bold.

Looking at the result matrix (Table 13), we can observe differences between groups. The column for B represents the unstandardized coefficient value: for the constant (secondary education), this is the mean value for all respondents in the secondary education group. For the other groups, this value represents the difference in mean response score for that group in comparison to the secondary education group.

For perceived usability, two relationship were identified under the α 0.05 significance level: the difference between bachelor's degree holders and the reference group and the difference between doctoral degree holders and the reference group. The latter is notable in that the mean difference between the groups was over 1, which is notable considering that the responses were on a 5-point Likert scale. In result demonstrability, the mean differences between groups were more even. Again, the difference between bachelor's degree holders and secondary educated employees was under the significance level. The differences between group perceptions towards the image factor were practically non-existent in both terms of mean difference and significance. As mentioned previously, this was expected due to the lack of normality in the variable.

The relationship between level of education and personal innovativeness was more pronounced. Both bachelor's degree and master's degree holders had a significant difference in comparison to the reference group. Interestingly, doctoral degree holders were less innovative than any other group. However, this observation is well above the significance level and most likely due to a small sample size of respondents in this group.

	Effect size η^2	**Magnitude**
Personal innovativeness	0.11	Medium/large
Perceived usability	0.08	Medium
Result demonstrability	0.05	Low/medium
Image	0.01	Low

Table 14 The effect size of level of education on the dependent variables.

The effect size η^2 measures the proportion of variance in the dependent variable that is associated with the groups of the independent variable (Richardson, 2011). The generally accepted interpretation for η^2 in ANOVA is 0,01 for small effect, over 0,06 for medium effect, and over 0,14 for a large effect. The effect size of level of education was on the

higher end of medium for personal innovativeness, medium for perceived usability, just below medium for result demonstrability and small for image.

4.2.2 Position at library

Next variable of analysis was the position of the staff member in the library. With three possible categories, the variable was coded into two dummy variables:

	Dummy variables	
	Expert	**Manager**
Position at library	1	0
	0	1

Table 15 Dummy coding for the position at library variable.

The reference value for the variable was employee, with experts and managers functioning as comparison groups.

Position at library	**Dependent variable: Perceived usability**			**Dependent variable: Result demonstrability**		
	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	2.899	0.137	0.000	3.486	0.148	0.000
Expert	-0.082	0.179	0.647	-0.192	0.194	0.324
Manager	0.587	0.309	0.060	0.347	0.334	0.301
Position at library	**Dependent variable: Image**			**Dependent variable: Personal innovativeness**		
	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	1.649	0.152	0.000	3.041	0.149	0.000
Expert	0.116	0.199	0.562	0.440	0.196	**0.027**
Manager	0.074	0.343	0.831	0.571	0.338	0.094

Table 16 One-way ANOVA test results for position at library. Differences under the significance level ($p < 0.05$) are highlighted in bold.

The employee's position at their library matrix (Table 16) displays a lesser degree of mean difference and significance than the level of education comparisons. Staff members in managerial positions reported a higher degree of perceived usability, albeit slightly above the significance level. Group perceptions towards result demonstrability varied in very small amounts, with managers reporting a slightly higher average score. Group differences towards the image factor were negligible. However, personal innovativeness was affected by the respondents' position at the library. Both experts and managers reported a higher level of personal innovativeness than employees, with the former difference being below the significance level.

	Effect size η^2	Magnitude
Personal innovativeness	0.06	Medium
Perceived usability	0.05	Low-to-medium
Result demonstrability	0.03	Low
Image	0	Negligible

Table 17 The effect size of position at library on the dependent variables.

Overall, the effect size of the staff member's position at the library was smaller than the effects of educational background. Personal innovativeness was the only factor where the effect size reached medium levels.

4.2.3 Library size

Respondents could report being employed in a small-to-medium (less than 30 employees) or a large library (30 or more employees). The variable is dichotomous by default, so no dummy coding was necessary. Small-to-medium size libraries were used as the reference value.

Library size	Dependent variable: Perceived usability			Dependent variable: Result demonstrability		
	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	3.017	0.180	0.000	3.386	0.194	0.000
Large libraries	-0.139	0.205	0.500	0.040	0.220	0.855

Library size	Dependent variable: Image			Dependent variable: Personal innovativeness		
	B	Std. Error	Sig.	B	Std. Error	Sig.
(Constant)	1.727	0.196	0.000	3.307	0.199	0.000
Large libraries	-0.014	0.223	0.950	0.023	0.226	0.919

Table 18 One-way ANOVA test results for library size.

The differences in both perceptions and personal innovativeness between employees in small-to-medium and large libraries was practically non-existent. The type of the organization has been identified as a mediating factor in previous studies, with non-profit organizations not benefiting from organization size in adoption processes when compared to businesses and private companies (Lee & Xia, 2006). Similar observations can be made from the results obtained in this sample.

	Effect size η^2	Magnitude
Personal innovativeness	0	Negligible
Perceived usability	0	Negligible
Result demonstrability	0	Negligible
Image	0	Negligible

Table 19 The effect size of library size on the dependent variables.

In addition, the effect size of organization size is negligible. It appears that for this sample, library size is not at all predictive of perceived innovation characteristics nor personal innovation.

4.2.4 Work experience in the library field

Work experience was measured on a continuous scale, thus regular linear regression was used in its analysis. Pearson's *r* was examined for direction and strength of correlation between variables and the coefficient of determination r^2 was observed for effect size.

Independent variable: Work experience in libraries			
Dependent variables	*r*	r^2	Sig.
Perceived usability	-0.350	0.120	0.000
Result demonstrability	-0.019	0.000	0.851
Image	-0.063	0.004	0.542
Personal innovativeness	-0.001	0.000	0.993

Table 20 Correlation coefficients and effect size between work experience in the library field and the dependent variables.

The correlation between perceived usability, result demonstrability, and image was negligible. However, a significant negative correlation was observed between work experience and perceived usability. As work experience increases, the perceived usability decreases. The correlation itself is low-to-medium with $r = -0.35$ and the effect size is low at $r^2 = 0.12$ (Ferguson, 2009). While the mean usability score for staff members with more work experience is lower, the total amount of variance is distributed more evenly around the mean of each level of experience (Figure 4).

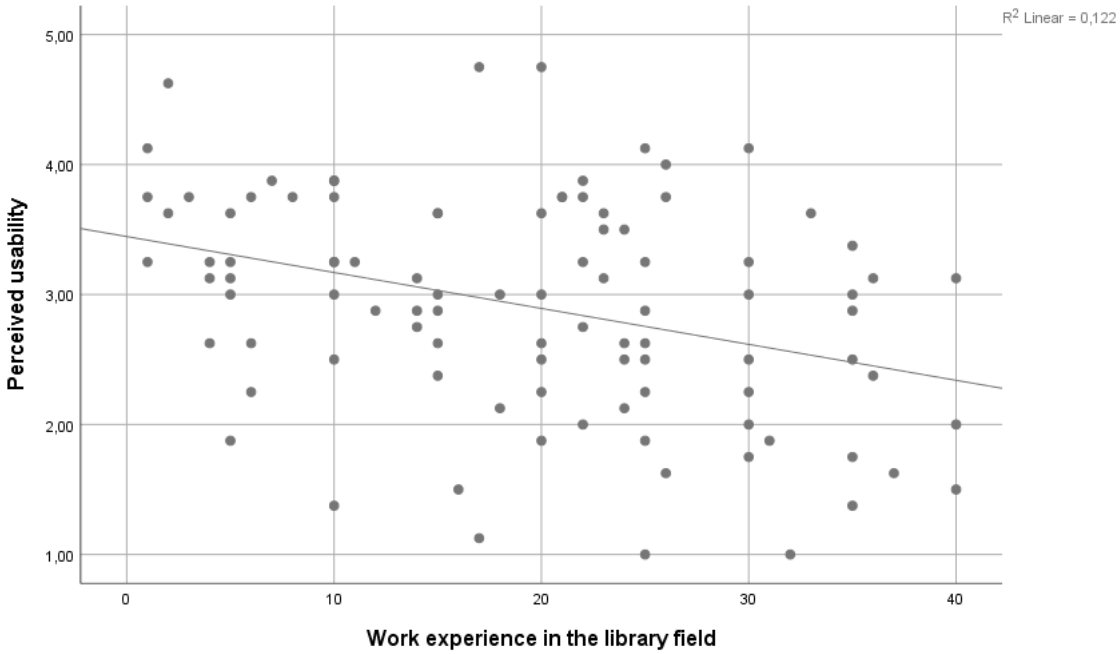

Figure 4 Scatterplot and regression line showing a slight negative correlation between work experience and perceived usability.

4.3 Personal innovativeness as a mediating variable

Mediation refers to the degree in which the relationship between two variables is affected by a third variable. Effectively, mediation is the indirect effect between the two variables that can be attributed to the mediator (MacKinnon, 2012). A simple mediation model is presented in Figure 5.

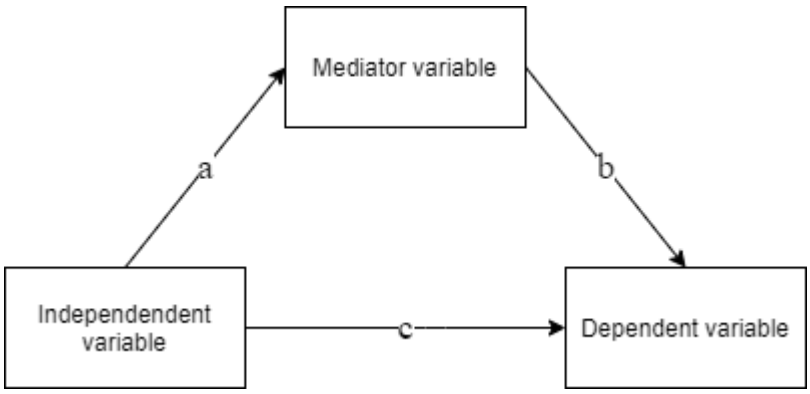

Figure 5 Single mediator model (not displaying error terms)

The direct effect between the independent and dependent variable is the value of path *c*. The indirect effect is the product between paths *a* x *b*. The total effect is the sum of both, *ab* + *c*. The mediation analysis was performed via the SPSS PROCESS macro, which outputs both a total effect model and indirect effect model. The mediating effect of personal innovativeness was tested, starting out with level of education as the dependent variable. As the dependent variable is categorical, the difference between the constant and each category is presented as its own path (Figure 6).

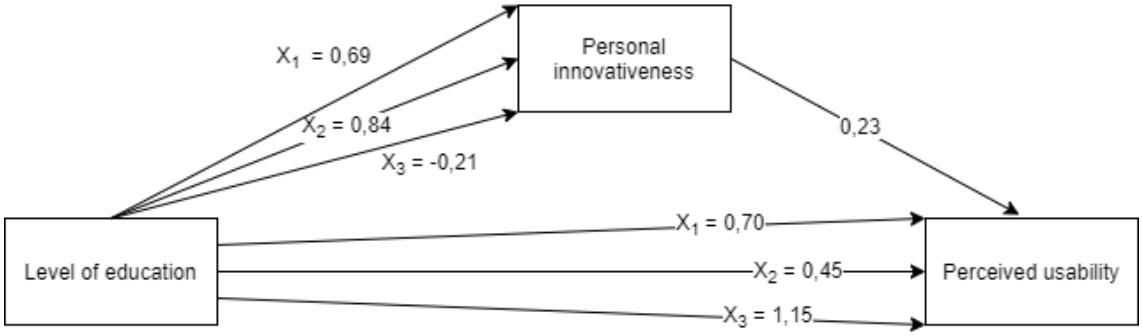

Figure 6 Illustrative model of mediation with non-standardized direct and indirect path coefficients.

The same values were used as the constant as in the previous ANOVA analysis. In other words, in Figure 6 secondary education functions as the baseline, X_1 refers to the difference between the baseline and bachelor's degree holders, X_2 to the difference between the baseline and master's degree holders, and X_3 to the difference between the baseline and doctoral degree holders. Examining the PROCESS output provides us with the indirect effect of each mediation path, along with a confidence interval. The confidence interval can be used for significance testing. If the interval excludes zero, the mediation effect can be considered statistically significant (MacKinnon, 2012).

The PROCESS output from the model in Figure 6 produced the following indirect effects:

```
EduLevel     ->     MPIIT        ->     MUse

        Effect     BootSE   BootLLCI   BootULCI
X1       ,1615      ,1048      ,0117      ,4135
X2       ,1958      ,1080      ,0308      ,4496
X3      -,0495      ,0591     -,1784      ,0541
```

The two rightmost columns of the output refer to the lower and upper limit of the estimated confidence interval (LLCI and ULCI respectively). Examining the results, we can observe that for X_1 and X_2 the bootstrapped confidence intervals do not contain zero. From this, we can conclude that the differences in perceptions towards usability between both secondary educated staff members and bachelor's degree holder and secondary educated staff members and master's degree holders are significantly mediated by personal innovativeness. The effect size of the mediation can be calculated as the proportion of the indirect effect out of the total effect (as displayed by the *B* value in Table 13). X_1 effect size is thus 0.1615 / 0.7073 = 0.23 and X_2 effect size = 0.1958 / 0.43. As such, the mediating effect of personal innovativeness is 23% of the total effect for X_1 and 43% of the total effect for X_2.

Level of education -> Personal innovativeness -> Perceived usability			
Constant: Secondary education	Effect	LLCI	ULCI
Bachelor's degree	**0.162**	0.012	0.414
Master's degree	**0.196**	0.308	0.450
Doctoral degree	-0.495	-0.178	0.054
Level of education -> Personal innovativeness -> Result demonstrability			
Bachelor's degree	0.108	-0.044	0.321
Master's degree	0.131	-0.057	0.355
Doctoral degree	-0.033	-0.147	0.048
Level of education -> Personal innovativeness -> Image			
Bachelor's degree	0.086	-0.059	0.285
Master's degree	0.104	-0.070	0.337
Doctoral degree	-0.262	-0.137	0.040

Table 21 Indirect effects of personal innovativeness on the relationship between level of education group differences and the dependent variables. Significant effects are highlighted in bold.

While level of education did have a significant effect on result demonstrability for bachelor's degree holders (Table 13), it appears that personal innovativeness did not mediate this effect to a significant degree. Interestingly, for the difference between doctoral degree holders and the secondary educated, personal innovativeness had a moderate suppressing effect on both perceptions towards usability and image, albeit not a significant one. The other relationships between level of education and the dependent variables displayed only very small and insignificant mediator effects.

Position at library -> Personal innovativeness -> Perceived usability			
Constant: Employee	Effect	LLCI	ULCI
Expert	0.096	-0.001	0.259
Manager	0.124	-0.009	0.336
Position at library -> Personal innovativeness -> Result demonstrability			
Expert	0.088	-0.007	0.253
Manager	0.114	-0.013	0.318
Position at library -> Personal innovativeness -> Image			
Expert	0.037	-0.062	0.186
Manager	0.048	-0.089	0.211

Table 22 Indirect effects of personal innovativeness on the relationship between position at library group differences and the dependent variables.

Mediation analysis of the staff members' position at their library did not display large nor significant indirect effects that could be attributed to personal innovativeness (Table 22). Respondent group differences towards perceived usability and result demonstrability fell just short of the significance interval, however the size of these indirect effects is small.

Library size -> Personal innovativeness -> Perceived usability			
Constant: Small-to-medium size libraries	Effect	LLCI	ULCI
Large libraries	0.005	-0.116	0.107
Library size -> Personal innovativeness -> Result demonstrability			
Large libraries	0.004	-0.096	0.102
Library size -> Personal innovativeness -> Image			
Large libraries	0.002	-0.074	0.064

Table 23 Indirect effects of personal innovativeness on the relationship between library size group differences and the dependent variables.

As expected, based on the results from previous testing, the mediating effect of personal innovativeness was practically non-existent between libraries of different sizes. Additionally, the difference between personal innovativeness scores from respondents from small-to-medium sized libraries ($\overline{x}$ = 3.02 s = 0.84) and large libraries ($\overline{x}$ = 2.88 s = 0.85) suggests that there is no discernable distinction in personal innovativeness between staff in small-to-medium and large libraries.

	Effect	LLCI	ULCI
Work experience -> Personal innovativeness -> Perceived usability	0.000	-0.004	0.004
Work experience -> Personal innovativeness -> Result demonstrability	0.000	-0.003	0.004
Work experience -> Personal innovativeness -> Image	0.000	-0.002	0.003

Table 24 Indirect effects of personal innovativeness on the relationship between work experience and the dependent variables.

Finally, mediation for work experience in the library field was tested (Table 24). Again, the mediation effect was practically non-existent. Interestingly, the significant negative correlation between work experience and perceived usability is not at all mediated by personal innovativeness. This implies that work experience itself is a significant predictor of perceptions towards usability.

4.4 Other observations

The perceptions towards voluntariness, visibility, and trialability were examined in an exploratory manner via general descriptive statistics.

		Voluntariness		**Visibility**		**Trialability**	
		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
Level of education	Secondary education	1.2	0.35	4	0.71	3.7	0.92
	Bachelor's degree	1.13	0.45	4.2	0.69	4.08	0.72
	Master's degree	1.13	0.38	4.01	0.88	3.89	0.88
	Doctoral degree	1	0	4.38	0.75	3.38	1.49
Position at library	Employee	1.08	0.25	4.18	0.72	4	0.78
	Expert	1.13	0.39	3.91	0.88	3.78	0.96
	Manager	1.33	0.71	4.5	0.56	4.11	0.7
Library size	Small-to-medium	1.09	0.29	3.91	0.92	3.78	0.99
	Large	1.14	0.41	4.11	0.77	3.93	0.84

Table 25 Sample mean and sample standard deviation table for voluntariness, visibility, and trialability.

In addition to the independent variables presented in Table 25, the effect of work experience on the three dependent characteristics was examined. However, no significant correlations were distinguished. Overall, voluntariness scores were low in all cases. This is somewhat expected, as the decision to adopt the new system was done collective-to-authoritarian contingent process. Additionally, library work tasks in a contemporary setting require the use of a library system without the possibility of opting out of system use. This may also explain the fairly high visibility scores reported by respondents: legacy

system usage was no longer possible when the new system went live, increasing visibility for the new system by default. Mean trialability scores were above neutral, suggesting that for the most part librarians felt like they had enough time to test the new system. However, there is a noticeable amount of variance within respondent groups towards visibility and trialability, as evidenced by the high standard deviation. Due to this, an ad hoc test was performed to test for PIIT mediation for these two characteristics.

The test showed no significant mediation between any dependent variables and visibility. However, the relationship between level of education and trialability were mediated to a great extent by personal innovativeness. The difference between secondary educated staff members and bachelor's degree holders (B = 0.383) was affected by a significant (LLCI = 0.012 ULCI = 0.376) indirect effect (B = 0.158), with a total effect size of 0.158 / (0.158 + 0.225) x 100 = 41 %. Furthermore, the difference between secondary educated staff members and master's degree holders (B = 0.181) had a significant (LLCI = 0.024 ULCI = 0.409) indirect effect (B = 0.1917). The absolute value of the direct effect was 0.0104, thus the effect size is 0.1917 / (0.1917 + 0.0104) x 100 = 95 %. In other words, this relationship is almost entirely mediated by personal innovativeness.

5 DISCUSSION

Based on the sample, we can conclude the following regarding the research questions:

RQ1: *How do sociodemographic variables predict perceived innovation characteristics?*

Level of education predicts perceived usability for bachelor's degree and doctoral degree holders with a medium effect size, result demonstrability for bachelor's degree holders with a low effect size, and personal innovativeness for bachelor's and master's degree holders with a medium to high effect size. Employment in an expert position predicts personal innovativeness with a medium effect size. The amount of years spent working at libraries is negatively correlated with perceived usability, with a low to medium effect size. Library size does not predict perceptions towards innovation characteristics nor personal innovativeness.

RQ2: *Does personal innovativeness have a mediating effect on perceived innovation characteristics?*

Personal innovativeness mediates the relationship between level of education, perceived usability, and perceived trialability for two groups: bachelor's degree and master's degree holders. For perceived usability, the mediation effect accounted for 23% of the variance in the former group and 43% of the variance in the latter group. For trialability, the mediation effect accounted for 41% of the variance in the former group and 95% of the variance in the latter group. Personal innovativeness had no other significant mediating effects.

RQ3: *Based on the data, what inferences can be made of the state of interpretive flexibility and technological frames in participating Lumikko libraries?*

Research question 3 will be addressed in more detail in chapter 5.2.

5.1 Limitations of the study

Several limitations were present in the study, which means that the results should be considered exploratory at best. First, the sample size was small at $N = 97$. A general recommendation for sample size is five observations per observed variable (Pallant,

2010). For 26 observed variables, a sample of at least 130 cases would have been preferable. Second, the instrument itself should have been validated more thoroughly. At least three items per scale would most likely have yielded a better Cronbach's alpha and allowed for more granularity in examining the research questions. However, this decision was based on a literature review where two-item scales had been successfully used in several studies (Appendix A).

Due to the small sample size and large body of literature applying the Moore and Benbasat instrument, it can be argued that the results of the questionnaire could have been applied in regression analysis directly without the PCA. The PCA approach was eventually selected as both an attempt as a critical look into the use of standardized instrumentation towards technological innovation and to function as a learning experience. While the PCA found relative advantage, compatibility, and complexity to effectively represent the same construct, the mean scores for these characteristics were also one-way ANOVA-tested individually against level of education with the following results:

Level of education	**Relative advantage**		**Complexity**		**Compatibility**	
	B	Sig.	B	Sig.	B	Sig.
(Constant)	2.550	0.000	2.300	0.000	2.733	0.000
Bachelor's degree	0.658	0.059	0.783	0.017	0.544	0.055
Master's Degree	0.374	0.236	0.497	0.093	0.419	0.103
Doctoral degree	0.825	0.132	1.450	0.005	0.850	0.057

Table 26 One-way ANOVA test between level of education and the mean scores for individual innovation characteristics (as opposed to the amalgamated usability construct).

Examining individual innovation characteristics, it appears that complexity accounts for the largest amount of variance in the usability construct (Table 25). With a larger sample size, it is possible that the differences between these characteristics would become more pronounced and they could be identified as individual factors.

Finally, the timing of the study was problematic. The first implementation wave consisted of only eight libraries, with the remaining libraries going live later during summer 2020. Additionally, the system had been in use for only two months in the wave one libraries before the questionnaire was administered, during which perceptions towards the new system are still in flux. However, depending on perspective, this can also be viewed as an

advantage of studying *in situ* change in organizations instead of the more common retrospective approach. This also allows for potential longitudinal studies in the future, which will be discussed in more detail later in this chapter.

5.2 Implications of the study

Despite the limitations of the study, some inferences can be made based on the data. Differences in perceived innovation characteristics between user demographics were not very striking, which can be considered indicative of low interpretive flexibility. This is evident in the low variance in perceived image between demographics: respondents seemed to agree that the system's biggest contribution was its operational capabilities instead of perceived prestige or reputation associated with using the system. As technological frame studies have been traditionally qualitative and labor-intensive, a mixed-mode approach of both qualitative and quantitative methods have been suggested in their study (Davidson, 2006). Based on the sample in this thesis, there may be some merit to using quantitative methods as an exploratory tool to map out the potential differences and their significance between groups within a population as part of the research planning process.

Secondary educated staff members systematically scored their perceptions and personal innovativeness lower than other groups. This may be indication that there is a separate technological frame for this group, which may have more reservations to experiment with new technologies as the other groups. The low innovativeness score reported by doctoral degree holders ($\overline{x}$ = 2.44 s = 0.24) is similarly interesting: even though the sample size for doctors is very small, there is also very little variance in the reported scores. However, the low significance levels throughout the observations imply that while several technological frames may exist within Lumikko libraries, they are mostly congruent with one another. In cases such as these, aligning frames may not be required and may in fact impose the dominant group's frame into the organization in a non-organic fashion. Instead, understanding the degree of flexibility, breadth, and complexity of the various frames may assist change management more than just a process of realignment (Davidson, 2006)

Another notable finding is managers reporting a higher usability and result demonstrability score than other staff categories. This observation echoes the notion that

managers perceive more control over change as employees. On the other hand, there is also significant relationship between bachelor's degree holders and perceptions towards result demonstrability. Out of all the 24 respondents from this group, 18 reported working at an employee position (such as assistant librarian or library secretary). Employees tend to perform many of the daily operative functions in the library, and hence often use the system more than the other staff groups. The average result demonstrability score for this group was well over neutral, which hints that even at the early stages of adoption the system provides sufficient and communicable feedback to the user in an operative context.

Within the usability construct, complexity was the most prevalent element. This may be due to the novelty of the system, despite the evaluation period during which the system sandbox was available for use. The perceptions towards complexity should constantly be evaluated by the libraries. If these perceptions do not change in the future, it is possible that overadoption has occurred. Overadoption refers to the adoption of an innovation based on its individual attractive elements instead of rationally gauging the benefits it provides as a whole (Rogers, 2003, p. 232). In the context of a library system, this could manifest in some features and functionalities of the system going unused due to a lack of understanding in how to exploit them for strategic or operational gain.

The negative correlation between the amount of years spent working at libraries and perceived usability is similarly notable. This trend may be evident of uncertainty avoidance and a preference to maintain the workflows, tasks, and processes which have become familiar to the respondents over the years. Especially in information technology driven expert work, the introduction of new technology may cause worry that the expertise of the employee will become obsolete (Moran, 2013, p. 58). Additionally, the frequency of technological changes may cause information overload and further anxiety. Staff training post-change is often necessary to embolden employees and to reduce uncertainty (Du Plessis & Mabunda, 2016). Depending on the type of library, this can be approached from different perspectives.

While library size did not impact the staff members' perceptions towards the new library system, it has been observed to affect how academic libraries approach change management. Smaller libraries have a higher frequency of using a combination of approaches such as human resources approaches (staff training) and structural approaches

(realigning roles and restructuring processes), while larger libraries tend to favor a single approach, most notably human resources (Yi, 2015). This implies that smaller organizations may be more agile in methodologies towards change, which also makes sense logistically: a smaller number of employees will most likely have a larger pool of shared knowledge and a smaller distance between employees and managers. As such, a bottom-up approach to training where employees themselves identify gaps in their capabilities and communicate them to managers may be preferable for smaller libraries. For larger libraries, the managers should identify key areas and employee groups where training is required and ensure that everyone has the opportunity to participate. In this context, the individual employee may perceive a greater power distance between themselves and the managers, which impedes articulating the need for specific training. Due to this, a top-down approach to set up training may be more beneficial for larger libraries. Intermediaries such as change agents and team leaders can be utilized to communicate training needs between employees and management.

Based on the sample, it is clear that personal innovativeness is a crucial mediating factor in how individuals perceive usability and especially trialability. As a result, it is important for libraries to focus on innovativeness as the most desired attribute for change agents, instead of solely focusing on the educational background or the staff member's current position at the library. Identifying innovativeness is a more difficult task for managers. Some suggested attributes for innovativeness include creativity, autonomy, motivation, flexibility, and the ability to observe (Cerinsek & Dolinsek, 2009). In libraries, these can manifest in participation in projects to introduce new services, initiative in group discussions, and quick learning of new tasks and processes. Teams can be a useful method of both identifying innovative individuals and communicating domain-specific training needs to management (Moran, 2013, p. 361).

5.3 Suggestions for future research

The results of the study can be utilized in future research in various ways, such as:

- Repeating the study for the wave two libraries to augment the existing sample data to provide a larger pool of responses for a PCA and greater granularity of results.

- In relation to the above, the questionnaire can be readministered to the wave one libraries in a longitudinal study examining the changes that occur in innovation characteristics over time, especially towards perceived complexity.

- A comparative study using the innovation characteristics approach to examine differences between the libraries who opted for the commercial library system and the libraries who chose to use the open source library system software.

- A study on how much, if at all, the switch from an on-site installed library system to a SaaS based system has affected the internal processes in how the system is administrated and operated.

- Using a mixed-method approach to examine technological frames in libraries to gain a deeper knowledge of whether incongruence exists (such as between secondary educated and higher educated staff members).

In conclusion, the library staff perceptions towards innovation characteristics were largely similar between demographic groups, suggesting that the libraries in the sample were socially coherent. The effect of personal innovativeness is far-reaching, and managers need to be able to identify innovativeness in individual employees to optimize preparedness for change initiatives. On an organizational scale, smaller and larger libraries may benefit from different approaches to change management and staff training. Finally, employees with a long history of work experience at libraries and employees with a lower level of education may need more support and time in familiarizing themselves to using the system.

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APPENDICES

APPENDIX A: Sample of studies using Rogersian innovation characteristics as dependent variables.

	No. of items measuring each innovation characteristic (where applicable)							
Study / article	**Relative advantage**	**Complexity**	**Compatibility**	**Result demonstrability**	**Visibility**	**Trialability**	**Voluntariness**	**Image**
Moore, G. C., & Benbasat, I. (1991) *	5	4	3	3	4	2	2	3
Verma, S., Jin, L., & Negi, A. (2005)	5	3	3	3	4	3	3	5
Gounaris, S. P., & Koritos, C. D. (2008)	5	3	3	3	3	4	3	3
Akturan, U., & Tezcan, N. (2010)	5	3	3	3	3	4	3	3
Liao, H., & Lu, H. (2008)	4	4	3	4	2	2		3
Plouffe, C. R., Hulland, J. S., & Vandenbosch, M. (2001)	2		3	3	2	2	2	3
Askarany, D., Brierley, J. A., & Yazdifar, H. (2012)	5	4	3	4		2		
Žvanut, B., Pucer, P., Ličen, S., Trobec, I., Plazar, N., & Vavpotič, D. (2011)	5	5	4		2	2		
Ntemana, T. J., & Olatokun, W. (2012)	5	5	5	2	2	5		
Van Slyke, C., Lou, H., Belanger, F., & Sridhar, V. (2010)	3	3	3	4				3
Jackson, J. D., Yi, M. Y., & Park, J. S. (2013)	3	3	3	2				2
Bozbay, Z., & Yasin, B. (2008)	4	3	3	2	5			
Verma, S., Jin, L., & Negi, A. (2005)	4	5	4		3			
Harvey Tanakinjal, G., Deans, K. R., & Gray, B. J. (2010)	3	3	3			3		
Agarwal, R., & Prasad, J. (2000)	8	6	4				4	
Carter, L., & Belanger, F. (2004)	4	4	4					4

Teo, T. S. H., & Pok, S. H. (2003)	5	4	4					5
Lin, H. F. (2008)	4	4	4					
Conner, C. (2002)	3	4	3					
Agarwal, R., & Prasad, J. (1998)	6	5	3					
Mallat, N., Rossi, M., Tuunainen, V. K., & Öörni, A. (2006)	3	4	4					
Rijsdijk, S. A., Hultink, E. J., & Diamantopoulos, A. (2007)	3	4	3					
Shih, H. P. (2008)	4	3	3					
Taylor, S., & Todd, P. (1997)	4	2	5					
Yang, H. J., Lay, Y. L., & Tsai, C. H. (2006)	5	5	6					
Lu, J., Liu, C., Yu, C.-S., & Yao, J. E. (2005)	6	4						5
Carter, L., & Bélanger, F. (2005)	5		4					5
Rokhman, A. (2011)	4		4					4
Zhu, K., Dong, S., Xu, S. X., & Kraemer, K. L. (2006)	2		4					
Huang, E., & Chuang, M. H. (2007)			2					
* using suggestions for shorter scales								

APPENDIX B: Questionnaire items and final questionnaire, including privacy notice

CONSTRUCT: COMPLEXITY

CX1 Vuorovaikutukseni uuden kirjastojärjestelmän kanssa on selkeää ja ymmärrettävää.
My interaction with the new library system is clear and understandable.

CX2 Mielestäni on helppoa saada uusi kirjastojärjestelmä tekemään, mitä haluan.
I believe that it is easy to get the new library system to do what I want it to do.

CX3 Mielestäni uusi kirjastojärjestelmä on helppokäyttöinen.
Overall, I believe that the new library system is easy to use.

CX4 Uuden kirjastojärjestelmän käytön opetteleminen on minulle helppoa.
Learning to operate the new library system is easy for me.

CONSTRUCT: RELATIVE ADVANTAGE

RA1 Uusi kirjastojärjestelmä nopeuttaa työntekoani vanhaan järjestelmään verrattuna.
Compared to the old system, the new library system enables me to complete tasks more quickly.

RA2 Uusi kirjastojärjestelmä parantaa työni laatua vanhaan järjestelmään verrattuna.
Compared to the old system, the new library system improves the quality of my work.

RA3 Uusi kirjastojärjestelmä helpottaa työntekoani vanhaan järjestelmään verrattuna.
Compared to the old system, the new library system makes it easier for me to do my job.

RA4 Uusi kirjastojärjestelmä antaa minun hallita työntekoani enemmän kuin vanha järjestelmä.
Compared to the old system, the new library system gives me greater control over my work.

CONSTRUCT: COMPATIBILITY

CO1 Uusi kirjastojärjestelmä on yhteensopiva työskentelytapojeni kanssa.
The new library system is compatible with the way I like to work.

CO2 Uusi kirjastojärjestelmä on yhteensopiva omien arvojeni kanssa.
The new library system is compatible with my values.

CO3 Uusi kirjastojärjestelmä on yhteensopiva ympäröivän organisaationi arvojen kanssa.
The new library system is compatible with the values of my surrounding organization.

CONSTRUCT: RESULT DEMONSTRABILITY

RD1 Uuden kirjastojärjestelmän käytön tulokset ovat minulle selkeitä.
The results of using the new library system are apparent to me.

RD2 Minulle ei tuota ongelmia kertoa muille, miten saavutan kirjastojärjestelmää käyttäessä tietyn lopputuloksen.
I have no trouble communicating to others how to reach a specific result when using the new library system.

RD3 Minulle ei tuota ongelmia kertoa muille, miksi uuden kirjastojärjestelmän käyttö on tai ei ole hyödyllistä.
I have no trouble communicating to others why using the new library system is or is not beneficial.

CONSTRUCT: VISIBILITY

VI1 Näen usein työtovereideni käyttävän uutta kirjastojärjestelmää.
I often observe my colleagues using the new library system

VI2 Olen nähnyt työtoverini käyttävän uutta kirjastojärjestelmää minulle uudella tavalla.
I have observed a colleague using the new library system in a way that was new to me.

CONSTRUCT: TRIALABILITY

TR1 Testasin uuden kirjastojärjestelmän käyttämistä ennen sen käyttöönottoa.
I tested the use of the new library system before its implementation.

TR2 Sain testata uuden kirjastojärjestelmän käyttämistä tarpeeksi pitkään tietääkseni, miten järjestelmä toimii.
I was able to test the use of the new library system long enough for me to know how to operate it.

CONSTRUCT: VOLUNTARINESS

VO1 Uuden kirjastojärjestelmän käyttö ei ole pakollista työssäni.
Using the new library system is not compulsory in my job.

VO2 Esimieheni ei vaadi minua käyttämään uutta kirjastojärjestelmää.
My superior does not require me to use the new library system.

CONSTRUCT: IMAGE

IM1 Uuden kirjastojärjestelmän aktiiviset käyttäjät ovat työyhteisössäni arvovaltaisempia kuin ne, jotka käyttävät järjestelmää vähemmän.
In my work environment, active users of the new library system have more prestige than those who use it less.

IM2 Uuden kirjastojärjestelmän käyttö on statussymboli.
Using the new library system is a status symbol.

CONSTRUCT: PERSONAL INNOVATIVENESS IN INFORMATION TECHNOLOGY

PIIT1 Olen vertaisteni joukossa yleensä ensimmäinen, joka kokeilee uutta tietotekniikkaa.
Among peers, I am usually the first to try out new information technologies.

PIIT2 En epäröi kokeilla uutta tietotekniikkaa.
I am not hesitant to try out new information technologies.

PIIT3 Pidän uuden tietotekniikan kokeilemisesta.
I like to experiment with new information technologies.

PIIT4 Jos kuulisin uudesta tietotekniikasta, etsisin tapoja päästä kokeilemaan sitä.
If I heard about a new information technology, I would look for ways to experiment with it.

Tervetuloa kyselyyn uudesta kirjastojärjestelmästä!

Tämä kysely on osa pro gradu -tutkimusta, joka kartoittaa kirjastotyöntekijöiden näkemyksiä uuden kirjastojärjestelmän innovaatio-ominaisuuksista, sekä sosiaalisten ja demografisten taustatekijöiden vaikutusta näihin näkemyksiin.

Kysely on suunnattu Lumikko-projektin ensimmäisen käyttöönottoaallon kirjastojen henkilökunnalle. Kyselyyn vastaamiseen menee noin 10-15 minuuttia.

Kyselyyn vastataan nimettömästi ja vastaukset käsitellään luottamuksellisesti. Vastausaikaa on keskiviikkoon 18.3. klo 15 asti.

Vastaamalla kyselyyn hyväksyt henkilötietojesi käsittelyn tietosuojailmoituksen mukaisesti (kts. alempi laatikko). Aloita kysely painamalla "Next"-painiketta tietosuojailmoituksen jälkeen.

Jos kaipaat lisätietoja tai kyselyyn vastaamisessa ilmenee ongelma, niin voit olla yhteydessä suoraan minuun:

whaimila@abo.fi / 044 238 1328

Ystävällisin terveisin,

Mitja Haimila
Master's Degree Programme in Governance of Digitalization / Åbo Akademi
* Required

Tietosuojailmoitus

Rekisterin hallinnoija ja tietosuojasta vastaava henkilö

Rekisteriä hallinnoi opinnäytetyön tekijä.
Henkilötietojen käsittelyyn, käyttöön ja tietosuojaan liittyviin kysymyksiin vastaa tutkimuksen tekijä:
Wille-Mitja Haimila / Master's Degree Programme in Governance of Digitalization
whaimila@abo.fi / 044 2381 328

Tutkimuksen nimi

"A sociotechnological analysis of new library system implementation: staff perspectives" (pro gradu -työ)

Henkilötietojen käsittelyn tarkoitus

Henkilötietoja kerätään tutkimuksen yhteydessä tehtävää tilastollista analyysiä varten. Analyysi tutkii sosiaalisten muuttujien vaikutusta näkemyksiin uuden kirjastojärjestelmän innovaatio-ominaisuuksista. Tutkimuksen tarkoituksena on esittää tämän analyysin pohjalta kehittämisehdotuksia muutos- ja projektijohtamiselle.

Henkilötietojen käsittelyn oikeusperuste

Henkilötietojen käsittely perustuu rekisteröitävän suostumukseen. Suostumuksen antamisesta tutkimukseen liittyvän kyselyn yhteydessä informoidaan kyselyn etusivulla omassa huomiolaatikossaan.

Kerättävät henkilötiedot

Kyselyssä kerätään seuraavat epäsuorat tunnisteet:
- Koulutustausta
- Kokemus kirjastoalalla työskentelystä vuosina
- Nykyinen työtehtävä kirjastossa
- Kirjaston koko (pieni/keskisuuri tai suuri)

Tutkimussuunnitelmassa kuvatun tutkimusasetelman vuoksi nämä tiedot ovat kyselyssä pakollisia.

Henkilötietojen lähde

Henkilötietojen lähde on kyselyyn vastaava henkilö.

Henkilötietojen vastaanottajat

Henkilötietoja voi tarvittaessa vastaanottaa rekisteristä vastavan luonnollisen henkilön lisäksi tutkimuksen ohjaaja:

Anssi Öörni / anssi.oorni@abo.fi. Puh. +358 503079333.
Kyselytutkimus on toteutettu Google Forms -palvelun avulla. Vastaamalla kyselyyn rekisteröity suostuu Googlen omiin tietosuojakäytäntöihin, joista tutkimuksen tekijä ei kanna vastuuta:
https://policies.google.com/privacy?hl=fi

Henkilötietojen siirtäminen EU-alueen ulkopuolelle

Rekisterin tietoja voidaan Google Drivessa säilyttää EU:n tai ETA:n ulkopuolella, mutta Google noudattaa tietojen siirrossa ja säilyttämisessä EU:n mallilausekesopimuksia, eli huolehtii tietojen suojauksesta EU:n asetusten mukaisesti myös EU:n ulkopuolella.

Lisätietoja: https://privacy.google.com/intl/fi/businesses/compliance

Automatisoitu päätöksenteko

Henkilötietoja ei käytetä automatisoituun päätöksentekoon eikä profilointiin.

Henkilötietojen suojaus

Henkilötietoja sisältävä tutkimusdata säilytetään Åbo Akademin verkkolevyllä. Pääsy verkkolevylle on suojattu salasanalla (HAKA-kirjautuminen). Kyselytutkimus on toteutettu tutkimuksen tekijän henkilökohtaisella Google-tilillä, joka käyttää yksilöllistä salasanaa. Tutkimuksen tekijä on vastuussa siitä, että päätelaitteiden tietoturva on data-analyysin aikana ajantasainen ja toimiva.

Henkilötietojen säilytysaika

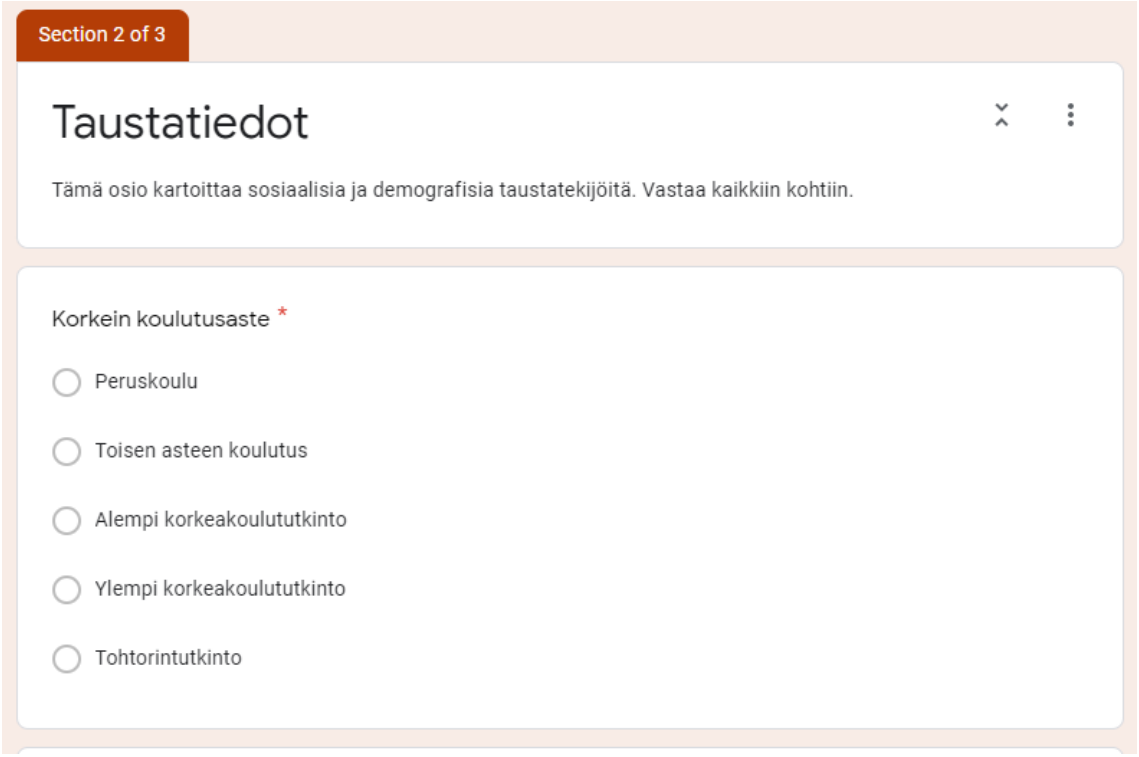
Tutkimuksen valmistuttua henkilötiedot poistetaan sekä Åbo Akademin verkkolevyltä, tutkimuksen tekijän henkilökohtaiselta työasemalta, että tutkimuksen tekijän Google-tililtä. Tutkimus valmistuu kesäkuuhun 2020 mennessä.

Rekisteröidyn oikeudet

Rekisteröidyllä on oikeus nähdä, mitkä tiedot hänestä on rekisteröity. Rekisteröidyllä on oikeus perua suostumuksensa henkilötietojen käsittelyyn.
Rekisteröidyllä on oikeus tallennettujen henkilötietojen poistamiseen.
Rekisteröidyllä on oikeus rajoittaa henkilötietojen käsittelyä.
Rekisteröidyllä on oikeus tallennettujen henkilötietojen muuttamiseen, jossa tapauksessa hänen aiempi vastauksensa kyselyyn poistetaan.
Rekisteröidyllä on oikeus saada henkilötietonsa ulkopuoliseen järjestelmään siirrettävässä muodossa (.csv-tiedosto). Henkilötietoja ei siirretä automatisoidusti.
Kaikissa tapauksissa yksilön tunnistaminen tapahtuu annettujen epäsuorien henkilötietojen ja kyselyn vastaamisajankohdan perusteella. Rekisteröidyn oikeuksiin liittyvät henkilötietojen muutokset osoitetaan rekisteristä vastaavalle luonnolliselle henkilölle.

OIKEUS TEHDÄ VALITUS VALVONTAVIRANOMAISELLE

Rekisteröidyllä on oikeus tehdä valitus valvontaviranomaiselle, jos rekisteröity katsoo, että häntä koskevien henkilötietojen käsittelyssä rikotaan tietosuoja-asetusta.
https://tietosuoja.fi/ilmoitus-tietosuojavaltuutetulle
Sähköposti: tietosuoja@om.fi
Puhelinvaihde: 029 566 6700



Mikä seuraavista kuvaa parhaiten nykyistä työtehtävääsi? *

- ◯ Toimihenkilö
- ◯ Asiantuntija
- ◯ Päällikkö / esimies

Kuinka monta vuotta olet työskennellyt kirjastoalalla? *

Short answer text

Kirjasto, jossa työskentelen on henkilökuntamäärältään: *

- ◯ Pieni tai keskisuuri (henkilökuntaa alle 30 henkeä)
- ◯ Suuri (henkilökuntaa yli 30 henkeä)

Section 3 of 3

Väittämät

Vastaa kaikkiin väittämiin asteikolla 1-5.

1 - Täysin eri mieltä
2 - Jonkin verran eri mieltä
3 - Neutraali
4 - Jonkin verran samaa mieltä
5 - Täysin samaa mieltä

Paina lopuksi "Submit" lähettääksesi vastaukset.

Uusi kirjastojärjestelmä nopeuttaa työntekoani vanhaan järjestelmään verrattuna. *

	1	2	3	4	5	
Täysin eri mieltä	◯	◯	◯	◯	◯	Täysin samaa mieltä

Uusi kirjastojärjestelmä parantaa työni laatua vanhaan järjestelmään verrattuna. *

	1	2	3	4	5	
Täysin eri mieltä	◯	◯	◯	◯	◯	Täysin samaa mieltä

Uusi kirjastojärjestelmä helpottaa työntekoani vanhaan järjestelmään verrattuna. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uusi kirjastojärjestelmä antaa minun hallita työntekoani enemmän kuin vanha järjestelmä. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Vuorovaikutukseni uuden kirjastojärjestelmän kanssa on selkeää ja ymmärrettävää. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Mielestäni on helppoa saada uusi kirjastojärjestelmä tekemään, mitä haluan. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Mielestäni uusi kirjastojärjestelmä on helppokäyttöinen. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uuden kirjastojärjestelmän käytön opetteleminen on minulle helppoa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uusi kirjastojärjestelmä on yhteensopiva työskentelytapojeni kanssa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uusi kirjastojärjestelmä on yhteensopiva omien arvojeni kanssa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uusi kirjastojärjestelmä on yhteensopiva ympäröivän organisaationi arvojen kanssa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uuden kirjastojärjestelmän käytön tulokset ovat minulle selkeitä. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Minulle ei tuota ongelmia kertoa muille, miten saavutan kirjastojärjestelmää käyttäessä tietyn lopputuloksen. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Minulle ei tuota ongelmia kertoa muille, miksi uuden kirjastojärjestelmän käyttö on tai ei ole hyödyllistä. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Näen usein työtovereideni käyttävän uutta kirjastojärjestelmää. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Olen nähnyt työtoverini käyttävän uutta kirjastojärjestelmää minulle uudella tavalla. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Testasin uuden kirjastojärjestelmän käyttämistä ennen sen käyttöönottoa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Sain testata uuden kirjastojärjestelmän käyttämistä tarpeeksi pitkään tietääkseni, miten järjestelmä toimii. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uuden kirjastojärjestelmän käyttö ei ole pakollista työssäni. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Esimieheni ei vaadi minua käyttämään uutta kirjastojärjestelmää. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uuden kirjastojärjestelmän aktiiviset käyttäjät ovat työyhteisössäni arvovaltaisempia kuin ne, jotka käyttävät järjestelmää vähemmän. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Uuden kirjastojärjestelmän käyttäminen on statussymboli. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Olen vertaisteni joukossa yleensä ensimmäinen, joka kokeilee uutta tietotekniikkaa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

En epäröi kokeilla uutta tietotekniikkaa. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Pidän uuden tietotekniikan kokeilemisesta. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

Jos kuulisin uudesta tietotekniikasta , etsisin tapoja päästä kokeilemaan sitä. *

	1	2	3	4	5	
Täysin eri mieltä	○	○	○	○	○	Täysin samaa mieltä

APPENDIX C: Component extraction tables

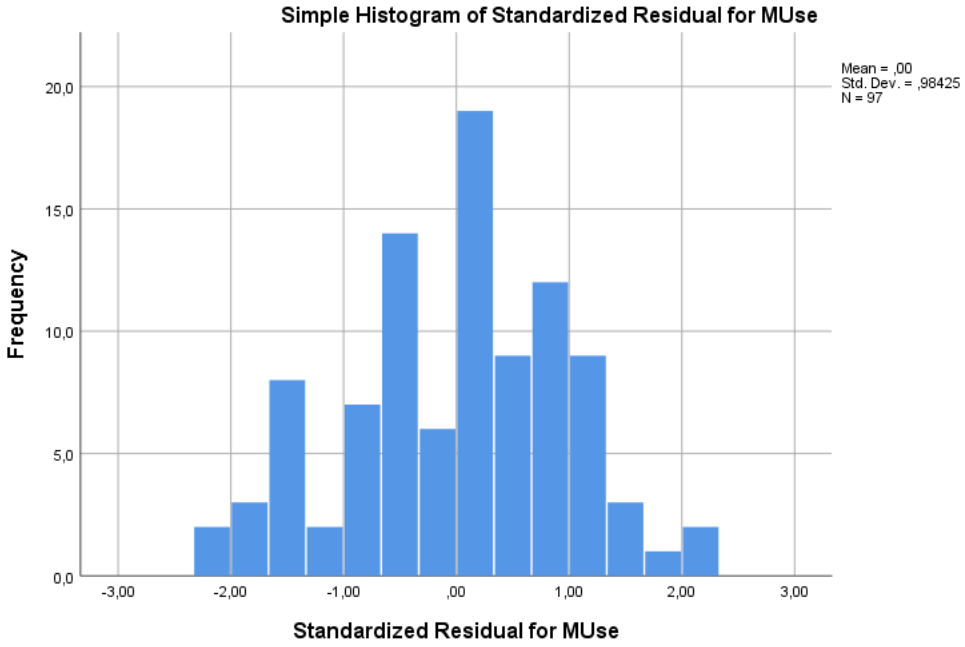
Initial PCA, determinant value 7,828E-7

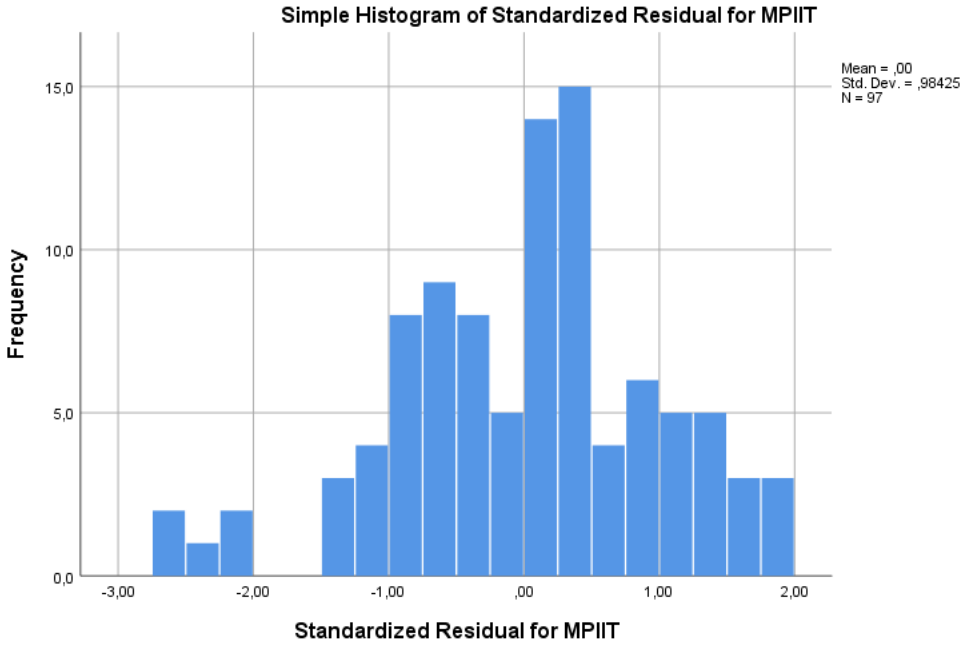
Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7,802	39,012	39,012	7,802	39,012	39,012
2	2,827	14,134	53,146	2,827	14,134	53,146
3	1,806	9,028	62,174	1,806	9,028	62,174
4	1,360	6,799	68,972	1,360	6,799	68,972
5	0,929	4,643	73,615			
6	0,866	4,329	77,944			
7	0,659	3,293	81,237			
8	0,473	2,364	83,601			
9	0,441	2,206	85,807			
10	0,435	2,174	87,980			
11	0,376	1,880	89,860			
12	0,354	1,771	91,631			
13	0,343	1,715	93,346			
14	0,274	1,368	94,714			
15	0,250	1,252	95,965			
16	0,213	1,064	97,029			
17	0,185	0,926	97,954			
18	0,156	0,781	98,735			
19	0,145	0,724	99,459			
20	0,108	0,541	100,000			

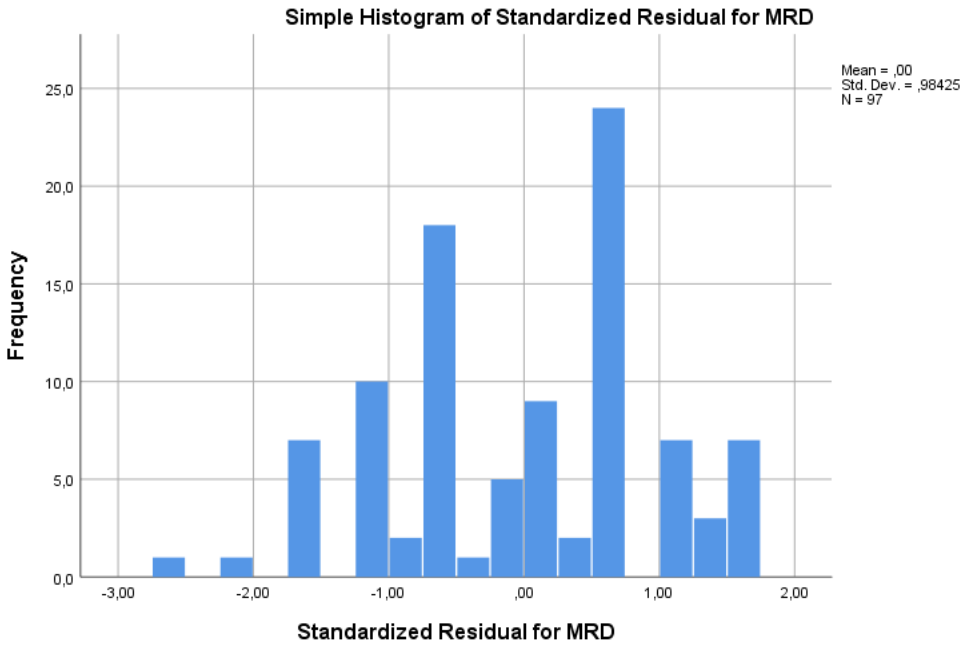
Final PCA, determinant value 2,189E-5

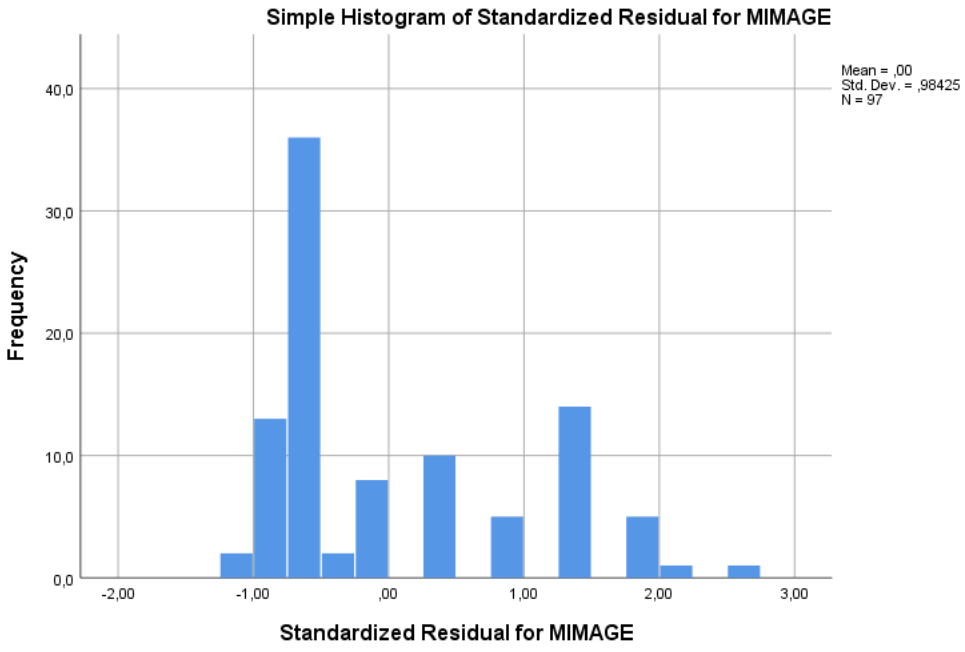
Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,216	38,848	38,848	6,216	38,848	38,848
2	2,650	16,563	55,411	2,650	16,563	55,411
3	1,713	10,706	66,117	1,713	10,706	66,117
4	1,233	7,708	73,824	1,233	7,708	73,824
5	0,753	4,703	78,528			
6	0,552	3,450	81,978			
7	0,468	2,927	84,905			
8	0,436	2,725	87,630			
9	0,405	2,532	90,162			
10	0,354	2,211	92,373			
11	0,314	1,962	94,335			
12	0,243	1,519	95,855			
13	0,220	1,377	97,232			
14	0,173	1,084	98,316			
15	0,155	0,968	99,284			
16	0,115	0,716	100,000			

APPENDIX D: Standardized residuals of dependent variables for normality testing, N=97






Simple Histogram of Standardized Residual for MRD
Mean = ,00
Std. Dev. = ,98425
N = 97
Frequency
25,0
20,0
15,0
10,0
5,0
0,0
-3,00
-2,00
-1,00
,00
1,00
2,00
Standardized Residual for MRD


Simple Histogram of Standardized Residual for MIMAGE
Mean = ,00
Std. Dev. = ,98425
N = 97
Frequency
40,0
30,0
20,0
10,0
0,0
-2,00
-1,00
,00
1,00
2,00
3,00
Standardized Residual for MIMAGE