Identifying concepts for studying implementation of information technology in facilities management

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IDENTIFYING CONCEPTS FOR STUDYING IMPLEMENTATION OF INFORMATION TECHNOLOGY IN FACILITIES MANAGEMENT

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ABSTRACT

Purpose: To contribute to identifying a conceptual framework for describing and understanding the processes involved when implementing and using Information Technology (IT) in Facilities Management (FM). This paper discusses how basic concepts from different theories can be applied in parallel when studying such processes. The purpose is to enrich the empirical data collection and to widen the scope of the data analysis, thereby shedding light on central aspects of the implementation process and identifying elements in the implementation process, which should be improved in order to add value.

Background: Experiences from the FM sector indicate that IT systems meant to support FM operations and workflows often do not generate the expected added value neither to the FM department itself nor to the basic organization supported by the FM department.

Approach (Theory/Methodology): Based on findings from exciting research on IT implementation a range of more generic theoretical concepts applicable to the typical setting or situation of IT implementation in FM has been found. These theoretical concepts all clarify and describe different aspects of the implementation process and they may all be applied when designing the methodological approach for analyzing the empirical data in implementation research.

Results and practical implications: This paper, however, proposes a wider basis, compared to existing literature, for understanding implementation and use of IT in FM which may better be capable of taking into account organizational and value adding perspectives.

Research limitations: The theoretical concepts discussed in this paper are mainly generic and non-technical, and the list is not complete. Finally the concepts discussed have no direct link to the concept of added value.

Originality/value: This paper aims at demonstrating a new and more comprehensive basis for studying the IT implementation processes in FM using a wider theoretical basis than found in existing literature.

Keywords: Implementation processes, Information Technology, Facilities Management

1 INTRODUCTION

This paper introduces a range of applicable theories, concepts, models and methodologies relevant when studying the complex process of implementation of information technology in Facilities Management organizations. It frames and describes a conceivable theoretical basis for identifying methods, which can ensure added value when implementing and using IT in FM organizations.

Implementing IT in organizations involves many aspects and entities in and outside the organization such as actors/staff, the specific IT being implemented, operations, workflows, added value, organizational structure, standards and the implementation process itself. In this paper the effectiveness of the *implementation process* is assumed to be essential when striving for maximum added value. This process is therefore regarded as the most important empirical phenomenon to be studied. The focus is on the internal processes in organizations but framed in a context also including the outside environment. Jensen and Scupola (2010) conclude that organizational, technological and external environments influence the spread of IT in the FM supply chain. This paper aims at complementing the more technical and management oriented research in this area, e.g. Madritsch and May (2009).

1.1 The typical setting when implementing IT in FM

Software typically included when FM departments invest in new IT or upgrade existing IT can roughly be divided into *Data Containers* (e.g. FTP servers, databases, BIM and GIS) and *Workflow Systems* (e.g. CMMS, CAFM and IWMS). Investments in IT will often include improvements in data: Improving *interoperability* (e.g. with IFC/COBie), *transparency* (e.g. with web based GIS) and *reliability* (e.g. including data cleaning and QA procedures).

Most often existing, relatively ready for use, software solutions on the market are chosen. Some FM departments however choose to adopt systems already in use in other parts of the organization, such as ERP systems (Redlein & Zobl, 2013) or GIS. Therefore no, or only a limited, development and design phase is included. Often the main effort lies in creating and inserting data into the system and in deploying the system. Often persons from quite different professions and from different levels in the organizational hierarchy are involved, but often only a limited number of persons are involved and also only few persons are expected to use the system.

2 RELEVANT THEORIES AND CONCEPTS

2.1 Criteria for identifying relevant theories

Despite intensive research in implementation and adoption of IT during the last three decades, no significant increase in the success rate of implementation projects is observed. New ways of viewing and understanding this research area is apparently needed. A comprehensive literature review conducted by Korpelainen (2011) shows that the four dominating theories used between 1999 and 2010 in the most sited literature articles in this area were the *technology acceptance model* (TAM), *theory of reasoned actions* (TRA), *diffusion of innovations* (DOI), and *theory of planned behavior* (TPB). Korbelainen (2011) concludes inter alias that a broader view should be applied and that *socio technical* frameworks and *change management* perspectives also should be considered in future research.

Criteria for identifying the theories and concepts suggested in this paper are built partly upon Korpelainen's recommendations, but also by accepting that the theoretical concepts must be relevant and applicable to the typical setting as described above. The theories can be used in parallel and each of them is contributing a specific focus and a way of approaching, framing and investigating the different issues in implementation processes. While not assuming full coverage specific relevant concepts and models within each of the theoretical frameworks will be described in the following, and it will be discussed how each concept can be made operational, that is how it can be applied to the research methodology.

2.2 Implementation from an innovation perspective

2.2.1 Innovation Theory

The work of Joseph Schumpeter has greatly influenced theories of innovation. He argued that economic development is driven by innovation through a dynamic process in which new technologies replace the old (Keklik, 2003). An *innovation* can be regarded as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. Four types of innovations can be distinguished between: product, process, marketing and organizational innovation (OECD, 2005).

The process of implementing IT in an FM organization can involve improvements and changes of the technology (*product innovation*) and of the work processes which the technology is meant to support (*process innovation*). The implementation process can also cause or require improvements and changes in the organization (*organizational innovation*). Parameters such as employees' educational level and the organization's support for education / training may indicate an organization's *innovation capability*. Likewise, in FM organizations the innovation strategies will also influence the innovation capability (Scupola & Tuunainen, 2011). Data on these parameters and the different types of innovations during the implementation process can be collected via interviews and longitudinal studies.

2.2.2 Diffusion of Innovations Theory (DOI)

Diffusion of Innovations Theory as described by Rogers (2003) deals with the many variables determining the rate of diffusion and adoption of innovations. DOI can be applied when studying smaller social groups, e.g. a FM department or an organization. Rogers (2003) defines an *innovation* as an idea, practice, or object perceived as new by an individual or other units of adoption – thus differing from the OECD definition mentioned above.

Some of the relevant DOI elements found in Rogers (2003) are stages and variables determining the *innovation-decision process*, variables determining the *rate of adoption*, variables related to *organizational innovativeness*, and stages in the *innovation process in organizations*. Rate of adoption variables may help predict or explain the duration of an implementation process. One such variable, which easily can be made operational, is "Complexity" belonging to the variable group "Perceived attributes of Innovations". The theory states that a high level of complexity results in a lower rate of adoption within a social group. By simply asking people involved in the implementation process how they perceive the technology being implemented, they will reveal rather precise information on complexity level (e.g. using the Likert-type scale). Another variable determining the rate adoption is "Norm" belonging to the group of variables "Nature of Social System". Norm is not as easily made operational. One cannot put the concept norm on a scale, but by studying an implementation process one may find things indicating norms among

people involved, relevant for understanding aspects of the implementation process. If for instance it is perceived as acceptable and regarded as a norm among employees to resist learning new things, this will obviously have great impact on the implementation process and can prolong the process significantly.

In DOI the diffusion and adoption process is regarded as *linear*, starting when the innovation first occurs on the agenda and ending when the whole social group being studied has adopted the innovation. DOI deals with innovations (e.g. new IT) as something static, which to some extent complies with the normal setting as described above. DOI does not take into account the interaction between people and technology and the transformation of the actors involved. For studying the *nonlinear* interaction which takes place between human actors or social groups and technology, and the transformation of the actors, sociotechnical theories can be applied.

2.3 Socio-technical understanding of implementation

2.3.1 Social Construction of Technology (SCOT)

Social construction of technology (SCOT) as defined by Bijker (1995) is a theory and a methodology within the research field of Social Shaping of Technology (SST). SCOT is primarily used to map and explain development of technology from a social science standpoint. It states that technology and human actions are mutually shaped by each other. It treats technological successes and failures symmetrically, insisting on the same sort of explanation for both (Sørensen & Williams, 2002). It is by trying to understand the *context* of the social world (norms, culture, politics, economics and technology) in which the technology is embedded, one finds the explanation for a technology's success or failure (principal of *symmetry*). *Relevant social groups* with competing interpretations of available technologies (principal of *interpretative flexibility*) determine which technology is taken for granted (principal of *closure*) and chosen. In SCOT social groups are defined according to the meanings attached by the social groups to the specific technology (attributes of meanings). A social group can perceive a technology as working or not working. Each social group constructs *problems* attached to the technical artifact, which can lead to different demands and developments of a given technology (*social shaping of technology*).

According to SCOT social groups cannot be defined a priori. The researcher must start by interviewing actors involved and ask what meanings they attach to the technology. At the end of each interview one can ask which other actors are involved (snowball sampling). When no new actors are mentioned all relevant social groups has probably been detected. The actors can then be placed in different social groups according to the meanings they attach the technology.

The following example could serve as an illustration on how to apply the SCOT methodology in practice: multiple IT solutions are known to be available for supporting a specific work process in an FM department, and the actors involved decides on technology X. To better understand why technology X is chosen, and what consequences the decision may have, each actor are asked for her or his meanings attached to this technology. Technology X may be found to be energy reducing by one group of actors (social group A) and user friendly by another group (social group B) and finally impossible to learn (e.g. difficult) by a third group (social group C). One could say that group A and B find the technology operable and C finds it not operable. If group A and B can unite and override/exclude group C in the decision process, this may contribute to explaining why technology X is chosen. Now, if people in group C were meant to become the

primary users of the IT system, which they found too difficult to learn, the system will quite certainly fail to be effectively adopted in the organization.

2.3.2 Actor-Network Theory (ANT)

Like SCOT Actor-Network Theory (ANT), as defined by Latour (1999), is a theory and a methodology within SST. ANT is used to study and map how actors influence each other, are connected and interact with each other. ANT follows the strategies and actions of central actors as they attempt to establish resources necessary for a project, particularly by enrolling other actors (Sørensen & Williams, 2002). In ANT a technology is an emerging and increasingly stabilized network of human and non-human (e.g. an IT system) actors (or *actants* to indicate the human and non-human nature of the entities involved). The connected actants (e.g. a FM department and an IT system) leads to a hybrid actant that does not necessarily practice the sum of the characteristics of the original actants. The objectives for investing in IT in an FM department can change considerably after the IT has been adopted. The ANT principle of *goal translation* may explain a typical situation, where the final goal (Goal 3) of connected actants (e.g. the hybrid actant "IT staff" or "staff IT") can differ from the original goal (Goal 1) of the people involved and the *inscribed goal* or function (Goal 2) of the IT. IT systems are inscribed with the designers and programmers own ideas of how people should work and utilize the system. This is particularly important to be aware of when implementing existing and ready to use IT systems.

All actants are part of a *collective*. The FM department could be replaced by "all FM businesses" and the IT system could be replaced by "what the main suppliers of IT for FM can deliver of IT". The responsibility for action must be shared among various actants in the collectives. An actant will always be part of one or more groups. Actants form groups called actor-networks within ANT. A group must be *deconstructed* in order to see what is going on inside.

ANT focuses on connections between actants and on how these connections are established and formed. From empirical fieldwork connections between actants can be traced and described. These connections can create hybrid actants.

For ANT truth does not exist. Truth should be understood as a state of affairs that can change over time (or *essence* can change). In the FM business, for instance, the statement that IT adds value could be regarded as true. A decade ago the same statement might have been regarded as not true. Therefor the researcher should focus on the forces that shape the essence. What made people in the FM business regard IT as value adding? What actants have been connected to shape this "goal" or understanding, and how where these actants brought together? Actions we are trying to measure are subject to *blackboxing*. An IT system can be taken for granted as a point (*punctualization*) in a sequence of actions. But alone it is a complex thing with many elements, and many actants can be involved to fix it, if it does not work. How many actants are really out there? In ANT an *intermediary* is something that does not act, but that is being acted upon. A person (an actor) uses a code (an intermediary) to get access to the IT system (could be an actor). A more operational version of the intermediary concept is discussed below.

2.3.3 Boundary Objects

A Boundary Object (BO) is a theoretical concept based on both SCOT and ANT and first defined by Star and Griesemer (1989). It is an entity (e.g. physical artifact, document, set of data, concept etc.) shared by different groups of professionals but understood differently by each group. One group does not necessarily understand the full context of use of the BO by another social group.

A BO serves as a common point of reference, mediation, conversation and negotiation. Groups of professionals involved in a process collaborate and exchange knowledge *around* BOs, which are flexible, epistemic artifacts inhabiting several intersecting social worlds and satisfying the information requirements of each of them (Star & Griesemer, 1989).

IT implementation projects in FM are most often cross-disciplinary: thereby making BOs relevant. Entities such as the project itself, the IT system or a document with the project time schedule can function as BOs. BOs may be essential for efficient collaboration and exchange of information between the different professional groups (e.g. management, consultants, FM administratives and technical staff in the FM department and future users in the organization) during the implementation process. If a BO can be identified in an IT implementation project, it can be studied how the involved groups relate to the BO, thereby shedding light on the nature of collaboration and exchange of information in the project.

Although BOs are seen to play an important role in coordinating cross-disciplinary work, boundary-spanning activities (such as face-to-face meetings, visits to each other's loci of practice, or internships) are necessary to support their role (Levina & Vaast, 2005). BOs make cross-disciplinary work possible and they perform at least three *types of work* in this context: motivate collaboration, allow participants to work across different types of boundaries and constitute the fundamental infrastructure of the activity (Nicolini, Mengis, & Swan, 2012).

2.3.4 Domestication theory

Domestication theory is also based on SCOT and ANT. It explains how foreign artifacts introduced into a preexisting context of practice gradually are "tamed" and appropriated and becomes a natural part of the (transformed) practice (Yoshinaka, 2012). Domestication of technology unfolds a series of ongoing processes or phases: appropriation, objectification, incorporation and conversion. *Appropriation* deals with the active process through which people adopt and use technology (Stewart, 2003), in other words how the technology is acquired and brought in to the context of practice. *Objectification* describes the change and adaptation of users and their environment. In general it deals with the acquisition, placement and organization of the technology in the heterogeneous context of practice and actions, and the strategies and goals concerning the technology once is has been acquired. Objectification is a process where the value by which the technology is perceived upon its appropriation is manifested (Yoshinaka, 2012). There is a multitude of strategies available for users when integrating a technology. Therefore technology will be objectificated differently across different sites and practices. *Incorporation* interprets the everyday usage of the technology and shows how it comes to play its role in the practice-setting. Here the technology is integrated into practice and routines - as taken for granted. *Conversion* involves the change of meanings and values with the technology, its symbolic new value or the general impression of the technology in the practice-setting. Operationalizing domestication theory when studying an implementation process could be done by focusing on specific themes connected to each of the phases mentioned above.

2.3.5 Intermediaries

Intermediaries can be regarded as actors offering intermediation services between other actors. Intermediaries can change intent, meaning and form of technology through their acts of mediating the technology between actors (Stewart & Hyysalo, 2008). The concept of intermediaries used here is a more active role in contrast to the passive role in ANT as described above.

Intermediaries between supply and use of IT play an important role in the process of implementing IT in organizations. Steward and Hyysalo (2008) explore the role of intermediaries in the development and appropriation of new technologies and deliver an operational method for mapping intermediaries. They define differences in profiles and in consequent mediating capacity of intermediaries. *Length* indicates reach between supply and use and *width* indicates content e.g. knowledge. Knowledge can flow between intermediaries.

Intermediaries can have different functions (Howells, 2006) and carry out different activities (Bessant & Rush, 1995). Bessant and Ruch (1995) identify four generic roles within these functions and roles: transfer of knowledge, sharing knowledge across user community, acting as brokering to a range of suppliers and diagnostic/innovation role in trying to identify what end users actually want. All which involve knowledge creation, translation and dissemination. Three distinct roles in social learning are fundamental different facets in the actions of intermediaries: *facilitating*, *configuring* and *brokering* (Stewart & Hyysalo, 2008).

According to Steward and Hyysalo (2008) configuring is not only technical but also symbolic: intermediaries provide an interpretation of the product, the meanings that people give to a technology (similar to attributes of meanings in SCOT). Brokering is e.g. raising support for the appropriation process from sponsors and suppliers. Facilitating is e.g. providing the computers, the software, the training and instructions needed to use it. The experience and knowledge which they supply to the users is as important as the actual technology.

Intermediaries, their activities, role and function in IT implementation projects can be identified by interviewing the different actors involved (also the intermediaries). The snow ball sampling method can be used to identify the intermediaries. Subsequently, their niches, reach, content and flow of knowledge can be mapped. An intermediary with a short reach, a thin content and little flow of knowledge may give limited added value to the implementation process. Intermediaries may prefer certain options and suppress others and thereby, in SCOT terminology, influence the shaping of technology. Some intermediaries may try to make themselves obligatory point of passage.

A typical IT implementation project in FM can involve intermediaries such as trade associations, user groups, IT consultants, system operators, user side intermediaries who buy and pay the IT, user side intermediaries who are involved in the implementation process and help colleagues use the system, and finally user side proxy users who learn to use the system in order to teach colleagues how to use the system as end users.

2.4 Organizational structuring of implementation

2.4.1 An organizational Configuration model

According to Mintzberg (2009) an organization can consist of five *basic parts*: operating core, strategic apex or top management, middle line or supervising management, technostructure or administration and standardization, and finally support staff outside the operating core flow. The structure of an organization can be explained by using the five basic organizational *configurations models*: simple structure based on direct supervision from the strategic apex, machine bureaucracy based on standardization of work processes defined by the technostructure, professional bureaucracy based on standardization of skills defined by the operating core, divisionalized form based on standardization of outputs defined by the middle line, and adhocracy based on mutual adjustment defined by the supporting staff. Five internal *coordination mechanisms* evolve as work becomes more complicated in an organization: mutual

adjustment, direct supervision, standardization of work processes, standardization of outputs and standardization of skills/knowledge. The five configurations models represents a set of five *internal forces*, exercised by the basic parts of the organization pulling an organization in five different directions: strategic apex pull to centralize, technostructure pull to standardize, operating core pull to professionalize, middle management pull to divisionalize/Balkanize and support staff pull toward collaboration and innovation in decision making.

Of special interest in regards to organizational configuration is the localization of Facilities Management within the five basic parts. This depends on the configuration of the organization and the tasks assigned to the FM department. A FM department in a machine bureaucracy, e.g. a production company, involved in maintenance of building facilities could be placed in the support staff. If the FM department is also involved in maintenance of machines used by the operation core, it could at the same time be placed in the techno structure. A FM department in a divisionalized organization, e.g. a municipality where facilitating public buildings is one of the core tasks, the FM department could be regarded as its own division in the operating core. Also of interest is which pull is activated when the FM department implements IT. When implementing a work flow system to support facilities maintenance, it could e.g. contribute to the pull from the techno structure to standardize.

2.4.2 An Organizational Diagnostic model

Several Organizational Diagnostic models used to collect information about an organization in order to establish the basis for appropriate organizational changes are available (Faletta, 2008). One of the basic, first proposed by Leavitt (1965), is the "diamond model" where the organization is conceptualized as consisting of four *interacting components*: people/actors, technology, tasks and structure. Change in one component will affect the other components, therefore requiring changes in all other components. The diamond model is a "closed system" which does not address the role of external environment (Falletta, 2008). In contrast Open System Theory offers models, where the organization is regarded as a social system dependent upon the environment in which it exist. The organization is subject to repeated cycles of input from the environment, transformation within the organization and output to the environment. The diamond model can be modified to also include other components, informal structures, and influence from the environment.

When implementing new IT a change is made in the technological component (according to Leavitt) and thereby triggering changes in the other components of the organization. Identifying which changes will occur and which changes should be made can be very complicated. One way to operationalize these premises, when studying the implementation process, could be to collect data on expected and planned changes in the organization and to observe changes during the implementation process. Discrepancy between expected, planned and observed changes may explain some of the problems which can occur during an implementation process.

2.5 Managing implementation processes

2.5.1 Project Management

Like any other project an IT implementation must be managed. Project Management can be seen as a series of phases (e.g. initiating, planning, implementing, controlling and closing), each containing different tasks connected to different themes (e.g. resources, time, cost, risk etc.) (DS/ISO, 2012, Table 1). Which phase in the project management process an implementation

project has reached and to which extent the project management tasks actually are being performed is relevant for studying.

2.5.2 Change Management

Change Management deals with handling changes in organizations, such as changes inevitably taking place when implementing IT. It is a multi-disciplinary linear oriented and descriptive approach following a series of steps in the processes. A conceptual framework presented by (Hayes, 2010) involves the following main "*steps of change*": recognizing need and start of the change process, diagnosis (review present state and identify future state), plan and prepare change, implement the change and sustain the change. In parallel with these steps issues regarding the people involved must be handled and the process must be reviewed according to planned schedule. Lewin argues that any level of behavior is maintained in a condition of *quasi-stationary equilibrium* by a force field comprising a balance of forces pushing for and resisting change. This level of behavior can be changed by either adding forces for change in the desired direction, and thereby increasing the tension, or by diminishing the opposing or resisting forces and thereby achieving a state of relatively low tension (Hayes, 2010, p. 43). Removing the restraining forces, rather than adding forces, in e.g. an organization is more likely to result in a more permanent change. Another basic concept applicable to change management is Lewin's concept of *permanency*, which states that successful change requires three steps: unfreezing, movement and refreezing. Unfreezing means destabilizing the balance of driving and restraining forces, movement means modifying the balance of driving and restraining forces to change the equilibrium to a new state. Refreezing involves reinforcing the new state and avoiding a relapse. When studying an implementation process at a given time, is it relevant to know which step of change is being conducted and to which degree the concepts of quasi-stationary equilibrium and permanency is being applied to the management of change.

2.6 Theories specifically aimed at IT implementation

Other, in this context, relevant theoretical approaches specifically developed to study IT in organizations are Structurational model of technology, Technology Acceptance Model (TAM) and Success and failure models. TAM developed by Davis (1989) aims to predict and explain IT usage behavior, that is what causes potential adopters to accept or reject the use of IT. The two theoretical constructs- perceived usefulness and perceived ease of use- are fundamental determinants (Korpelainen, 2011, p. 14).

Structurational model of technology developed by Orlikowski (1991) is based on Giddon's theory of structuration. The model delivers a frame for studying the relationship and influence between the three components human agents, technology and institutional properties of organizations. One important concept in this regard is the technological frame, which is a person's assumptions, expectations and knowledge about a technology. If persons have significantly different or unaligned technological frames (incongruence) it may lead to difficulties and conflicts, when implementing the technology (Orlikowski & Gash, 1994).

Success and failure models: Most failures in IT projects can be attributed to a series of known root causes and most of the symptoms of IT project failures belong to the project management root cause (Al-Ahmad et al., 2009). In the same way, as with failures, successes in IT projects can be attributed to a series of known causes or factors that fall into a series of categories, such as system quality, information quality, information use, user satisfaction, individual impact and organizational impact (DeLone & McLean, 1992). When studying the implementation process

one may identify some of these elements and test whether they lead to failure or success as expected.

3 CONDENSING AND CATEGORIZING THE THEORIES

Table 1-4 contains categorized and condensed presentations of theories and concepts for studying implementation of IT in FM organizations. Applicability to research in this area and the main relevant concepts and variables are briefly explained.

Table 1: Category: Innovation / Type: Linear

Theory or concept	**Main focus and idea**	**Applicability / Main relevant concepts and variables**
Basic Innovation concepts	Economic development is driven by innovation. Innovation is the implementation of new improved artifacts e.g. technologies.	Gives focus to the innovation in the implementation process / Product, Process and Organizational innovations
Diffusion of Innovations theory (DOI)	Conditions which increase or decrease the likelihood that an innovation will be adopted by a given culture, and conditions determining the rate of adoption	Range of variables can be used to explain the rate of which the IT is adopted in the FM organization / Variables determining the innovation-decision process, rate of adoption and organizational innovativeness

Table 2: Category: Sociotechnical / Type: Non-linear

Theory or concept	**Main focus and idea**	**Applicability / Main relevant concepts and variables**
Social Construction of Technology (SCOT)	Formalizes steps and principles to follow when analyzing the causes of technological failures or successes. Technology is shaped by humans.	Framework for understanding the choice and development of IT and the human interaction with IT / Social groups, Attributes of meanings, Interpretive flexibility.
Actor Network Theory (ANT)	For mapping how human and non-human actors influence each other, are connected and interact.	Mapping the actants involvement and interconnection. Can give insight in the translated goals of the hybrid actors / Actants, Connections and Goal translation
Boundary Objects	Entities shared but understood differently by different social groups and used for collaboration and exchange of information.	Observing the use of BOs can give insight in collaboration and knowledge exchange between disciplines and social groups involved / BOs and types of work
Domestication theory	Deals with how foreign artifacts introduced into a preexisting context of practice gradually can become a natural part of the (transformed) practice.	Frames the process with focus on usage, values and meanings of the IT / Appropriation, Objectification, Incorporation and Conversion.
Intermediaries	Intermediaries are actors offering intermediation services between other actors, e.g. passing on knowledge.	Identifying the intermediaries and mapping how the organization gains access to knowledge / Functions, Activities, Roles. Facilitating, Configuring and Brokering.

Table 3: Category: Organizational / Type: Diagnostic and Configuration models

Theory or concept	**Main focus and idea**	**Applicability / Main relevant concepts and variables**
Leavitt's Diamond	Maps the interaction between main components in an organization. A change in one component causes (and requires) changes in all other components.	Discrepancy between expected, planned and observed changes may explain problems that can occur during the implementation process / Organizational components: Technology, Tasks, Actors and Structure
Mintzberg's organizational configuration framework	Defines basic parts that constitute an organization according to standard categories. Different internal forces pull the organization in different directions.	The FM department's involvement in the organization can be depicted and understood in the model. Internal forces caused by the IT being implemented can be explained / Basic parts, Coordination mechanisms, Configuration models and Internal forces

Table 4: Category: Management / Type: Prescriptive and partly Linear

Theory or concept	**Main focus and idea**	**Applicability / Main relevant concepts and variables**
Project management	Predefined project management phases with tasks connected to themes	The degree to which the phases and tasks are being conducted can be mapped / Phases, Themes and Tasks
Change management	Predefined steps for managing changes in organizations.	The phase and the handling of the implementation can be mapped and explained / Steps of change, Quasi-stationary equilibrium and Permanency

4 IMPACTS ON THE EMPERICAL STUDIES

The theoretical framework, concepts and variables described in this paper provide guidance and focus areas for collecting empirical data, in the research area of IT implementation in FM. The framework establishes theoretical concepts in which the empirical data can be fitted when being collected and analyzed. The concepts can be used as basis for the coding process. Finally they deliver the lenses by which the empirical data can be analyzed and understood.

5 CONCLUSION

This paper proposes a basis for understanding implementation and use of IT in FM which may be capable of taking into account organizational and value adding perspectives. This paper shows that varying theories complement each other as necessary approaches and methodologies to apply when studying the complex processes of implementing and using IT in FM.

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