

Digitalization and change management: Different ways to project success

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Abstract—The digitalization is realized through a series of change-bringing projects. For the success of the digitalization, the study of the conditions leading to a greater project success rate is thus interesting. The context in which change happens is as interesting as the change itself, yet an early search of the literature revealed that the literature on change management offers little support for qualitative, context rich studies. This study presents a theoretical model derived from a review of the literature on change management with a focus on digital projects. Qualitative iterative coding of 51 relevant articles led to the definition of nineteen dimensions of change management split into two constructs: the type of change and the type of change management approach. Furthermore, the success of digital projects is defined according to five dimensions. The model is intended to support qualitative empirical studies, the ultimate goal being the discovery of the different ways leading to project success. Therefore, short definitions and lists of keywords that might be employed in speech or written documents to refer to the dimensions are given.

Keywords—Change management; organisational change; digitalisation; project success; project failure.

I. INTRODUCTION

“By trial and error” is a common answer when managers are asked how they digitalize their organizations [1]. It is a risky strategy when a large proportions of change initiatives fail [2], [3]. Change management depends notably on dimensions of the change like scope or rate [2]. Helping managers choose an appropriate change method has long been studied [2]–[4], but there is no concept adapted to the digitalization showing the types of change and the appropriateness of management methods to ensure the success of a project [5]. This paper aims to define change management related factors with a literature review. This includes factors specific to the change itself such as the width of the scope and factors specific to the method adapted, such as the level of implication of employees.

The digital transformation is the integration of all actors and data, through innovative technologies that affects the whole value chain, aiming to create more competitive organizations [6]. It combines several digital innovations for organizations and networks that have a strong impact on organizational structures, managerial practices, and organizational culture [7]. Based on the above definitions, we define the digital transformation as the

process by which innovative solutions, based on digital technologies, transform areas of organizations to reach a new form where the technological and the social aspects are integrated. The digitalization prompts many changes [5] that are realized by following a sequence of various projects, sometimes organized by following a roadmap [1]. Asked for the first time years ago [4], the question of how to choose an appropriate change method is not settled [1], [2]. This is the question that will be addressed in the doctoral studies of the author. To achieve this goal, it is necessary to first review the literature to define change management and its factors that might affect the success of projects realized in the context of the digitalization.

In the literature there is a gap on the understanding of change [8]. This paper aims to address this gap by providing a review of the dimensions implied in change projects as a first step to the creation of a model for empirical qualitative studies. We aim to provide an answer to the following question. What are the dimensions of change management that are relevant for the study of the different ways to ensure success of a digital project? This question will be answered using a literature review. For researchers, a review of the literature helps identify research gaps and opportunities, and formulate research designs. The expected contribution to practice is a better understanding of change management by managers, although the main contributions to practice will come in the later phases of the project, in the form of the creation of a decision support artefact based on the knowledge gained during the empirical phases of the research project.

This article is structured as follows: In section 2, a short background on change management and the digitalization is presented. Section 3 contains the research design, section 4 the resulting theoretical model, section 5 the discussion and contribution, and section 6 the conclusion.

II. THEORETICAL BACKGROUND

Organizational change is a vast field, of which change management forms one part [9]. Previously, change was seen as an event that could be carefully planned and where benefits would be realized in a consolidation phase [2]. Critics of this view argue that the consolidation is possible only when the environment is not changing [10], which is rarely the case [3]. In answer to this challenge, approaches seeing change as a continuous process have emerged, represented by the metaphor

of “becoming” organizations, which means that organizations are constantly in the process of becoming something else [3]. In the context of the digitalization, this view of the ever-adapting and agile organization is often mentioned and the digitalization is realized as a series of smaller projects rather than a single large exercise [1]. Both views are complementary and support organizations in their transformation [3]. However, there are gaps in the study of the conditions under which one or the other would offer a greater chance of success [5]. Some elements are known, for example the critical role of the implication of employees [11] or the value of a planification stage [12], but empirical evidence stays limited and few links are made with the overall context of the organization.

In the context of the digitalization, there are more change methods corresponding with the planned than the emergent approach, but there are examples of both [5]. In any cases, a large number of change management method is available to managers, yet there is still a high failure rate, possibly due to distrust or confusion of managers [2] or a lack of fit between the interest of researchers and managers [9]. Some methods being more appropriate in given circumstances, organizations have two options: select a method appropriate with the circumstances, or act on the environment to fit their preferred method [4]. Both require managers to have sufficient knowledge of their organizations, the change at hand, and the criteria making a method appropriate [4]. It also implies that managers can act upon the internal and external circumstances affecting the change, which is not always the case [4]. It is thus interesting in the context of this review of the literature to distinguish between factors related to the change management approach, which the managers may control, and factors inherent to the context, which the managers do not control. This last category represents the dimensions of the change itself.

The above considerations about digitalization and change management is the foundation for the next step addressing the identification of the components of change. The literature has used several terms to describe change. To realize a qualitative content analysis, an initial categorization of change characteristics is necessary [13]. This aims to be a starting point for the development of a theory of change, and the number, the structure, and the definition of the categories might change during the analysis [13]. In previous literature reviews and conceptual works, change is described as being of a certain scale [2], [14], rate [2], [14], [15], state of anticipation [2], [15], [16], and organizational range [16]. On a different perspective, what is meant by digital projects success must also be defined. As initial categories a balanced view is adopted, to allow the consideration of various dimensions beyond the financial measures. Specifically these are the financial, customer, internal and long term perspective [17]. These form our initial categories.

III. RESEARCH DESIGN

This literature study was realized in the context of the doctoral studies of the author. After an initial exploration of the subject of change management in the context of the digitalization both in the literature [5] and with managers working in the field [1], the next step is the creation of the theoretical model that will guide the rest of the studies.

This research followed a critical realist perspective where it is recognized that objects and concepts exist independently of observation, although it is not possible to observe them in a theory-neutral way [18]. In the context of change management research, it means that change exist whether or not it is identified. However, the study of change requires to consider the context and the knowledge of the researcher. Thus, methods developed for positivist stances may be used in a critical realist perspective, as long as care is taken to separate the objects from the contextual observations made about them [18].

The first goal of this study is to identify the factors relevant in the study of the ways to favor digital projects' success. This includes dimensions of change, change management approach and success of digital projects. These factors are identified through a review of the literature. Literature reviews allow to develop theory for future empirical research [19]. In this case, first the literature related to change management approach in the context of the digitalization is reviewed. Then is reviewed the change management literature without limits as to the digitalization, to ensure that relevant articles not mentioning the digitalization explicitly are included. A search protocol is established and followed for the selection and filter of the articles [20]. The protocol includes the definition of the unit of analysis, the definition of inclusion and exclusion criteria, a reflection concerning the article sources to include and the elaboration of search strings. In the case of this study, the unit of analysis is the project, however to ensure a better coverage in the literature the articles using the organization as a unit of analysis were also retained. The search strings used are as follow:

1. (“digital transformation”, “Industrie 4.0”, “Industry 4.0”, “smart factory”) AND (Process, step, stage, “change management”, “organisational change”, “organizational change”)
2. (“change management”, “organisational change”, “organizational change”) AND (“definition”, “description”, “concept”, “characteristic”)

The publications are searched in five article databanks, respectively Science Direct, EBSCO-Business Source Complete, IEEE, and ProQuest. These are selected because they include the major publications, journal and conferences, in the field of information management and change management. Criteria limited the search to articles written in English for which full text was available. The publications were evaluated by one analyst first on the basis of the abstract, then the full article. The decision to keep or reject an article was based on a list of inclusion and exclusion criteria, to limit the influence of personal bias [20] as presented in Table I. The final sample is formed of 51 articles from the classical change management theories such as the works of Lewin [21] to more recent literature specific to the digitalization. Qualitative codes are applied to the content of the articles. The codes are iteratively revised according to a Qualitative Content Analysis method, until a list of codes representing the source material is identified [13]. The initial codes were chosen based on existing theory. For the codes related to change management, categories were taken from a literature review on the characteristics of change [2]. The codes related to the dimensions of success were initially taken from the balanced scorecard approach [17], initially developed to ensure

a strategy is derived into objectives presenting a balanced approach to performance.

TABLE I. INCLUSION AND EXCLUSION CRITERIA

SEARCH, PART 1	
Inclusion criteria	Discuss the digital transformation as a change process Includes a presentation of steps or stages of change in any organisational level OR Includes a discussion on change management approaches.
Exclusion criteria	Digital transformation is used only as a context rather than the object of study Process of change is not mentioned or not suggested
SEARCH, PART 2	
Inclusion criterion	Describes or gives attribute of change
Exclusion criteria	Does not present characteristics of change Characteristics are not supported by empirical evidence or previous studies Characteristics of change come integrally from a single previous study

The codes are then finally grouped and analyzed to form dimensions of a theoretical model. No quantitative content analysis was made, considering the theory generation goal in opposition to a deductive approach [13].

Using the developed theoretical model, the future steps of the author's doctoral studies include the iterative validation and improvement of the model before leading to the creation of a decision-support artefact. The next step is a first evaluation of the model based on interviews with field experts. The following steps are multiple-case studies to refine and check the validity. The model will then be used in a larger scale analysis using set-theories methods. Finally, based on the knowledge gained through the cases and the large-scale analysis, a decision-support artefact will be developed that will help managers select a change management approach adapted to the conditions of the project to facilitate success.

IV. RESULTS: THEORETICAL MODEL

The detailed theoretical model is presented in Table II. The dimensions are split into three categories. The first category describes different characteristics of change.

These are meant to allow the description of the contextual factors surrounding a project, as context is essential to the study of change management [4].

The second category describes the actions taken to manage the project, to be able to related which type of change management approaches are useful in a given context [4].

Finally, the third category shows different dimensions of success, in other words, the different ways in which one may describe the success of a project.

TABLE II. RESEARCH MODEL: DIMENSIONS OF CHANGE MANAGEMENT RELEVANT FOR PROJECT SUCCESS

	Dimension	Short definition	Example of keywords
Dimensions of change	C1 Anticipation	Whether the change was considered beforehand	expected, identified, not considered, predicted, surprise
	C2 Choice	The margin of action that the manager or change agent have	compelled, control, deliberate, prefigured
	C3 Criticality	The level of urgency or the importance of the change subject	fundamental, important, routine, urgent
	C4 Level	The organizational level	lower levels, managerial, operational, senior management
	C5 Persistence	The idea that a change can be maintained without efforts or constant repetition	irreversible, maintain, permanent, short-term
	C6 Scale	Whether a change is perceived as having a big or a small impact	accumulation, complex, considerable, fine-tuning, minor
	C7 Scope	The centralization or decentralization of decisions	centrally, decentralize
	C8 Source	The provenance of change	environment, external, from within, internal, pulled
	C9 Range	The categorization of people affected by the change, from individuals to society	departmental, everyone, industry, society, team level
	C10 Rate	The perceived pacing or tempo of the change exercise	-
	C10.1 Speed	-	abrupt, calm, fast, static
	C10.2 Constancy	-	continuous, discontinuous, fluctuating, linear, punctuated
	C10.3 Regularity	-	dynamic, pendulum, recurrent, turbulent

	Dimension	Short definition	Example of keywords
Dim. of change management approach	M1 Business domain	Level of implication of representatives from the business domains affected by the project	systemic understanding, application domain
	M2 Employees	Level of implication of employees in the project	active part, coercive, collaborative, consultation
	M3 External	Level of implication of partners external to the organization	different companies, external partners
	M4 Flexibility	Degree to which the project management aspects may change to respond to the environment	agile, adapted, revised, iterative
	M5 Goals	Degree to which the end goals are established and clear	starting point, standard, stated vision, targets, unclear
	M6 Information Systems	Degree of master of capabilities related to the information technology and information systems aspects	analytics competencies, experts, IT professionals
	M7 Leadership	Level of commitment to the project by the relevant leaders	commitment, gives direction, steered
	M8 Steps	Degree of structure given to the planification of the project	strategy, detailed plan, phases, change process
	M9 Transparency	Degree of communication and sharing of information between the involved parties	collective vision, common agreement, communication, silo mentality
Dimensions of project success	O1 Financial objectives	Degree to which the project reached the monetary or financial goals.	costs savings, economic value, profit, share price
	O2 Customer / competitive objectives	Degree to which the project reached the goals related to market, competitive or customer-oriented goals.	business opportunities, increase in quality, market growth
	O3 Process / internal objectives	Degree to which the project reached the goals related to internal business processes and internal efficiency.	efficiency, flexibility, optimized process, process problems
	O4 Long term / learning objectives	Degree to which the project is susceptible to be beneficial in the long run.	continuous learning, developing skills, knowledge creation, institutional memory, sustainable change
	O5 Employees' acceptance of change	Degree to which the affected employees accept the outcomes of the change.	acceptance, resistance, employee burnout, motivation, job satisfaction, positive attitude, trust and support

To be used in qualitative research, the research model must allow the identification of the different dimensions in the speech of interviewees, in other written documents and as a basis for the description of observations. Therefore, lists of keywords were developed for each dimension. In tables III to V are given the partial lists of keywords for three dimensions, one for each of the construct.

TABLE III. LIST OF KEYWORDS, C1 ANTICIPATION

ad hoc	designed	improvisational
adapt	detailed plans	just happen
alert	discovered	monitor
anticipate	early-warning	not considered
assessment	emerge	plan
blind	expected	precedent
change-ready	flexible	precipitated
conscious	identify	...

The tables III to V represent the different words extracted from the articles and associated with the same codes. These lists were then reduced to eliminate words of the same family, for example “adapt” and “adapted” or “expected” and “unexpected”. This reduction was made having in mind the purpose of the theoretical model, which is to serve as basis for semantic content analysis.

TABLE IV. LIST OF KEYWORDS, M2 EMPLOYEES

active part	contribute	feedback
authority	cooperation	genuine participation
carry them out single-handedly	direct interaction	given the opportunity
centrality of employee engagement	directive	inclusion
choose not to participate	employee flexibility	motivate
coercive	empowerment	non-voluntary
collaborative	encouraged to implement	participation
consultation	encouraging staff to identify	...

TABLE V. LIST OF KEYWORDS, O3 PROCESS/ INTERNAL OBJECTIVES

effective	faster time-to-market	optimized
effectiveness	flexibility	product quality
efficiency	intelligence	...

V. DISCUSSION AND CONTRIBUTION

In general, the dimensions may be presented as a continuous scale, for example between “fully” anticipated to “not at all” anticipated. However, on a qualitative perspective, the dimensions are not all balanced in their presentation on this scale. For instance, when criticality is mentioned, is it much more often to describe a core, fundamental, or severe matter than it is to describe a trivial or peripheral change. Similarly, rate is much more often used to describe a high and irregular pace compared to slower, smooth changes. Several authors insist on the survival question of change or the inevitably higher pace of change in the last decades [3], which might explain this focus. Other dimensions, like scale and anticipation, are more balanced, being about as likely to be used to describe big or small changes in the case of scale, and predicted or unpredicted changes in the case of anticipation. Finally, some dimensions have a skewed connotation in the articles reviewed, such as employee participation which is typically seen as a good factor [11].

The theoretical model may be visualized as a basis for future empirical studies in the Figure 1. The eventual goal of the research project is to discern different ways to the success of a digital project. This will be done with a qualitative-based set-theory approach rather than a method aiming to measure a correlation.

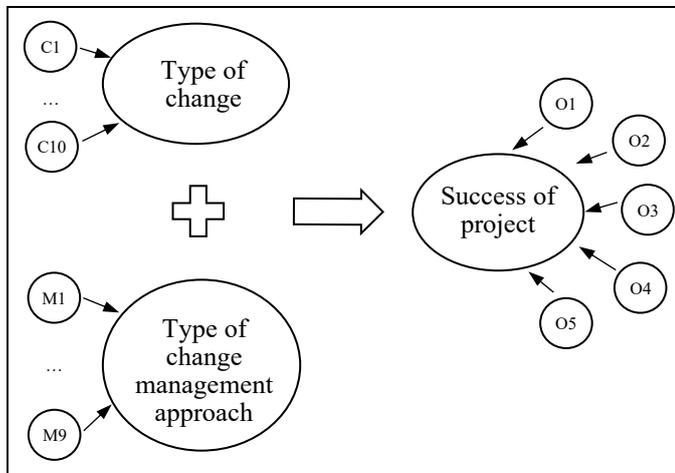


Figure 1. Summarized theoretical model

Studies of change management have in the past focused on giving recipe for success [5] or discussing theoretical fundamentals of organizational change [3]. The usefulness of the change management literature for practice has often been questioned [2] and failure rates are high possibly because of a lack of fit between research and the practical needs [22]. It is why a qualitative approach based on the principles of set theory has been selected when building the theoretical model.

Change management is a phenomenon dependent on several factors, some internal to the organization such as the preferred management style and some external such as the stability of the competitive environment [4]. In order for the change project to be successful, there must be a fit between the selected method and the environmental factors. This either means that the organization must choose an approach fitting the environment,

or influence the environment to fit their preferred approach [4]. It is a complex process and qualitative studies would allow to retain the details of the change process, rather than only concluding that a change has happened [23]. Thus, to study the conditions leading to change qualitative methods are relevant. However, during this literature review no models adapted to support qualitative research were discovered. Notably, content analysis of case studies rely on a clear and rigorous categorization of field data [23]. Good theoretical basis and rigor in the data analysis are necessary for qualitative studies in order to have an interesting scientific contribution [24]. That is the gap intended to be filled with the model suggested in this study.

VI. CONCLUSION

This article presents the creation of a theoretical modal of the factors of change management affecting the success of digital projects. This model was developed in the context of the doctoral studies of the author, to serve as an analysis framework for the rest of the studies. Literature in the field of change management contains a lot of material, yet presents several flaws, notably concerning the study of the conditions in which some approaches are more effective than others [5]. Furthermore, as the digitalization occupies more place in the projects of organizations, it is critical to study ways to favor the success of digital projects [1]. This model is based on a review of the literature and subsequent qualitative content analysis. The model splits the dimensions of change management in two constructs. The first category represents factors related to the change in itself, that the project management team cannot influence. The second represents the factors within the sphere of influence of the management team, namely the dimensions related to the change management approach used in the project. Finally, several dimensions of the success of projects are defined.

There are several limits to this study, notably the inclusion of English language articles only and the possible exclusion of relevant sources outside the selected article databanks. Furthermore, the coding and analysis were made by one examiner only. However, care was taken to be transparent with the article selection and analysis process.

The theoretical model is intended to be used in future qualitative empirical studies. The next step is a validation of the model with expert interviews to complement the data extracted from the literature. Multiple cases studies will follow, in which the framework will serve as an analysis framework for the qualitative data. The model may eventually be used in a set theory type of analysis to uncover the different ways to reach project success, based on the contextual factors, controllable or not. Finally, the knowledge gained will be used to develop an artefact to support managers in the decision of which method should be used in a given context to enhance the chances of success.

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