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Master of Science Thesis Report

MSc in Construction Management and Engineering

Organizational Change Readiness for Implementing ISO15288.

Testing the Relationships between Change Valence and Change Commitment

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“Never stop fighting until you arrive at your destined place - that is, the unique you. Have an aim in life, continuously acquire knowledge, work hard, and have perseverance to realize the great life”

A.P.J. Abdul Kalam

Preface

This master thesis report is written by the student Leonidas Papadopoulos for obtaining a master degree of science in Construction Management & Engineering (CME) at Technical University of Delft in the Netherlands. The research project is the last obligatory part of the master program, lead by the Civil Engineering department in collaboration with the faculties of Technology, Policy & Management and Architecture & Built Environment.

The author was born in the former Soviet Union and grew up in Greece. He obtained primary and secondary education in Athens and holds a Master of Engineering in Civil Engineering from the Democritus University of Thrace in Greece.

Gaining and developing managerial knowledge were the main motivations to attend the aforementioned master program. The experience of living, working and studying abroad for an extended time period was a dare the author desired to have.

A Dutch engineering organization offered an 8,5-months research contract and partly supervised the project. The author worked in offices in Amersfoort in the market group of Rail & Public Transport. The engineering company desired a graduation project thesis in the topic of Systems Engineering or Building Information Modeling, and provided room for interpretation and exploration of a potential topic.

Several persons have contributed practically, psychologically and scientifically in completing with success this master thesis and generally the whole master program. I would like to warmly express my gratitude to them starting with my first supervisor Geertje Bekebrede. Her critical comments and advices were extremely valuable in writing a comprehensive and well-presented master thesis. My company supervisor advised, guided and supported me throughout the whole process. His friendliness and personal care on my motivation were driving parameters in staying positively focused on the graduation goal. I would like to thank also the last two committee members, the chairman Martin de Jong for understanding the uncertainty in finding a professor and his commitment to the project, as well as Sander van Nederveen in being a loyal committee member throughout the entire process of searching graduation project.

Lastly I would like to thank my parents and my adorable aunt Simela Chionidi for their financial and psychological support. Furthermore, great appreciations to my friend Evangelia Kitsiou for being a lovely and compassionate partner.

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Executive Summary

This report is commissioned with the aim to test an organizational change readiness theory in a Dutch engineering company towards more consistent design process and control of projects. Research focuses on change commitment and change valence concepts. The objective is to explore the relationships between the levels of employee's change commitment and change valence constructs. The two main research questions are: 1) To which extent the organization is ready to implement a new change in the design process based on ISO15288? 2) How could the organization influence the organizational change readiness through change valence variables/constructs?

Weiner's (2009) theory of organizational change readiness has been adopted and literature study is conducted on the aforementioned topics in order to search for theoretical and measurement models. Likert-scale data (123 people) has been gathered in a Dutch engineering organization and used for analysis. Non-parametric and parametric statistical analyses have been conducted. Factor analysis has been executed to explore theoretical model(s) on the collected data and to calculate employees' scores on the studied constructs. In the next step, regression analysis is used to test the relationships between constructs of the concepts (change valence and change commitment).

Literature study in aforementioned concepts reveals that change commitment model is composed by three components: (1) Affective, (2) Continuance, (3) Normative commitment. Affective commitment refers to the emotional attachment of the employee to the organization and his involvement in the organization. It is characterized by a strong desire (desired based commitment) to maintain relationship, willingness to put extra effort for the sake of the organizations. Continuance commitment refers to awareness of costs associated when leaving the organization or resisting proposed changes. Employees with high levels of continuance commitment feel the *need to* (cost-based commitment) stay in the organization or commit themselves to changes. Normative commitment reflects the obligation of employees to stay in the organization. Employees with high level of normative commitment feel that they *ought to* (obligation-based commitment) continue employment or accept/reject proposed changes.

Change valence concept counts 5 constructs: (1) Appropriateness, (2) Change Efficacy, (3) Leadership Support, (4) Personal Benefit, (5) Attitudes. Appropriateness refers to the need and necessity for a change. Change efficacy is the confidence employees feel in initiating and implementing a new change. Leadership support expresses the leadership communication to the employees about a change and their expressed commitment to that change. Personal benefit refers to "what is in it fot me" the change can bring to the employees. Finally attitudes measure the feelings of the employees to a change. Factor analysis on commitment model shows that the data demonstrates a measurement model that is very close to the theoretical model, whereas change valence models reveal some difficulties in demonstrating the theoretical model. Attitude construct has been rationally removed from the data model and personal benefit construct has been renamed as personal obstruction. Factor scores on the measured constructs are calculated based on the extracted measurement models and subsequently used in regression analysis. Comparison between the results of the factor scores and the results of a quantitative analysis of the theoretical measurement model shows reliability and validity of the theoretical models. Regression analysis shows that affective commitment is strongly associated only to appropriateness change valence construct. Continuance commitment is negatively associated to personal obstruction. Finally, normative commitment is positively associated to appropriateness and leadership support whereas negatively associated to personal obstruction.

In conclusion, from qualitative and statistical analyses, employees consider themselves ready to accept ISO 15288 and are quite confident to do so. Leaders do not communicate very clearly that change so their lack of communication does not force people to commit to this forthcoming process. Desired commitment shows very positive and encouraging results for being ready to change for implementing ISO15288.

According to the regression analysis results, affective commitment is changing positively (increases) when appropriateness increases. Appropriateness is the only change valence variable influencing the value of affective commitment. That entails clear message and need for change can affect the commitment of people originating from their desire. Continuance commitment is influenced from

personal obstruction. This result shows that people's possible disrupted relations within in the company can reduce their commitment because they believe there is no cost or damage in abandoning the change effort. Lastly, normative commitment is influenced by appropriateness, leadership support and personal obstruction. Personal obstruction influences negatively, while appropriateness and leadership support influence positively. Either positively or negatively, the strongest impact is brought by appropriateness, then in decreasing scale, personal obstruction follows and finally leadership support. That means, if change managers desire to alter the value of normative commitment with the highest impact and possible less effort, they should focus more on appropriateness and personal obstruction. In summary, maintaining good relations in the company among employees, proving that ISO 15288 is necessary for the company, and showing more commitment from the management team to the employees could oblige employees in the new situation.

Regarding the scientific value of this research, the researcher believes that more extensive literature research should be done in both models. The possibility that change valence constructs could be more, or a better commitment model could be used, is important. Also due to the nature of studied constructs, more detailed approach is suggested by including moderators like age or gender, and mediators, like years of experience or roles or education. Mediators could be used to explain why change valence factors are influencing commitment while moderators could classify, if applicable, the strength of that connection.

Even if the population is sufficient (123 data) to conduct parametric statistical analysis, another test on larger population could validate the results. Likert-scale data has been interpreted in interval data. Although this method is used extensively in scientific research, researcher believes this interpretation is a huge limitation. Additionally, the clear message of the change limits the validation of the results. Better communication and demonstration of the change to people would internally validate the results. Finally, the engineering company is an international and big organization, though the testing of the theory should be executed in more than one engineering companies in the civil engineering industry.

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Abbreviations

ACS	Affective Commitment Scale (Statistical Variable)
AEC	Architecture, Engineering & Construction
APPR	Appropriateness (Statistical Variable)
ATT	Cognitive Component of Attitudes (Statistical Variable)
BEN	Personally Beneficial (Statistical Variable)
CCS	Continuance Commitment Scale (Statistical Variable)
CFA	Confirmatory Factor Analysis
EFF	Change Efficacy (Statistical Variable)
EFA	Exploratory Factor Analysis
ISO	International Organization for Standardization
NASA	National Aeronautics and Space Administration
NCS	Normative Commitment Scale (Statistical Variable)
OCR	Organizational Change Readiness
OLS	Ordinary Least Square
PMI	Project Management Institute
SE	Systems Engineering
SUP	Leadership Support (Statistical Variable)

Chapter 1: Project Description

1.1 Research Relevance

Due to the wide acceptance of international standards in markets, there have been conducted many studies on how greatly standards have improved the world. The benefits mainly range in governmental, societal and business aspects. Even though a variety of standards and norms are extensively used in manufacturing industries, the civil engineering industry is still struggling with the concept of standardization of project management. That deficiency mostly stems from the uniqueness of projects in the industry to satisfy customer's needs. However, studies show that standardization could be useful in improving quality, like Hamzah, Ramly, Salleh, Tawil, Khoiry, and Che (2011) found by studying quality of outcomes that when "having a good project management practices in place, there will be a significant effect in reducing numbers of defects in housing sector"(p.1). Pollock (2002) states that in a design process "by systematizing the project management system, consistency in results can be achieved"(p.113). Gerundino (2012) states that, "case studies also provide evidence that a focus on standards can be the core of an upgrading strategy through which companies can aim at entering higher value-added segments of the value chain in their respective industries"(p.9). With regard to internal company processes, a research by Laporte, Chevalier, Maurice (2013) reveals that the ISO standard 29111 assisted to map project management processes for small-scale projects that offer structured approaches to its managers. The literature shows positive empirical results in systematizing the project management processes and overall quality systems.

The topic of project management standardization is an interesting topic for organizations desiring to excel delivered products, but the standardization progress is limited only to small scale projects. This organization desires the potential benefits of standards applied in its operations, therefore towards that goal an ISO (15288) on systems engineering standard will be introduced in 2016. This ISO methodology can be found in Appendix A.

1.1.1 Using ISO15288 in Civil Engineering Industry

The International Organization for Standardization (ISO) develops and publishes such standards, like the ISO 15288. ISO 15288 is an international standard for Systems and Software engineering which can be used as a tool for controlling quality of outcomes. ISO 15288 according to Syntell.org is "an international standard for systems and software engineering life cycle processes. This standard, developed by system and software engineering experts from around the world, provides a foundation for successfully developing and implementing complex systems. It establishes a framework for describing the life cycle of systems created by humans and defines a set of processes and associated terminology within that framework".

Based on discussions with practitioners in the company in the architecture, engineering, and construction industry (AEC), a need for a standard in systems engineering domain as it is applied in this industry is required. A number of specialists, like functional signaling engineers working on the European Rail Traffic Management System (ERTMS), believe that by adopting ISO 15288, results could benefit the overall performance and company growth. The importance of this ISO standard is stressed and referenced many times in the Dutch systems engineering guideline, as a tool for creating more integrated solutions to customer's needs.

Figures 1 and 2 present the overall idea of how ISO15288 can be used in systems engineering processes, the so-called V-model in Systems Engineering, which within the developed method is used iteratively and recursively. In the first phase ISO 15288 tries to define steps for capturing customer's requirements, also for controlling and integrating stakeholders' demands/requirements in an iterative way till the final and full requirement list is set. In the second phase, these requirements are transformed into functional requirements, design principles and design options. These options are evaluated at the third and final stage of the process based on trade-off matrices. These loops are accomplished as many times as necessary till the final design and construction planning is ready.

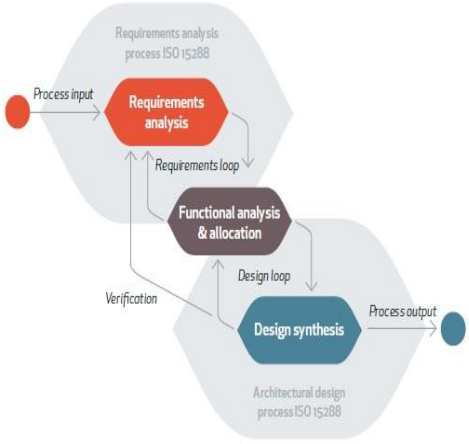


Figure 1: The iterative character of specifying

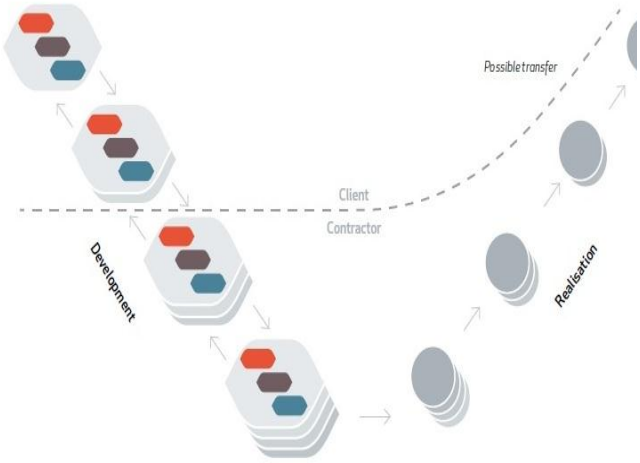


Figure 2: V-model with client contractor point

1.1.2 Integration Interfaces

Although in the last decades a need for a framework of applied systems engineering (SE) processes has been stretched by practitioners, the industry just now undergoes a transition. The Dutch SE guideline starts its introduction by noting "A changing sector recognizes challenges". One of the biggest challenges is the integration of the systems engineering methodologies within construction practices, since systems engineering originates traditionally from aerospace industry (NASA,2007). The main problem in construction industry is the deficiency in applying systems engineering processes within project organizations and within the companies itself (ProRail, Rijkswaterstaat, Bouwend Nederland, Vereniging van Waterbouwers, NLingenieurs, Uneto VNI, 2013). Nevertheless the application of systems engineering in civil engineering projects becomes more and more popular among organizations like ProRail, Rijkswaterstaat, Bouwend Nederland and many other (ProRail et al, 2013). As a consequence, we see (from discussions with practitioners within the company) that market practitioners have been busy on that subject for the last couple of decades. For that integration, organizations are possibly required to rearrange some matters within the company. These matters could be either related to resources or behavioral aspects. Behavioral aspects could entail difficulties in preparing the organization for change whether people are reluctant to accept new working approaches. These matters will possibly cause

difficulties in integrating systems engineering norms. Therefore many organizations face the potential difficulties in altering current working methodologies to this new standardized systems engineering process.

A potential new working methodology entails some difficulties in integrating the new approach to the old one or even replacing the old in any organization. Therefore, a change like that might hide not desirable interfaces in terms of conflicts between implementers or change managers with employees. Some advantages and disadvantages of using ISO standards are in table 1. From discussions with senior technical leaders, the reduced cost is a disputed advantage. By imposing people to follow specific steps, the effort and time needed to accomplish a design increases. Therefore, cost might increase temporally, but long-term system costs potentially decrease. A very relevant disadvantage is the fact that standards force people to temporally or permanently change their methods. That might create discomfort and anxiety to people. Again from discussions, experienced engineers claim that people who do not perform well in systems thinking and lack experience, get stressed when changes in technical requirements occur or when something has to be performed in different way than usual.

Advantages of Standards	Disadvantages of standards
Reducing costs	The implementation of standard removes the creative element of the program
Increasing productivity of market share	Standards force people to change their methods
Ensuring interchangeability	Standards do not prevent bugs of design solutions
Minimizing waste	
Ensuring safety	
Quality assurance	

Table 1: Advantages and disadvantages of ISO standards

Change managers are aware that this proposed change might never become successful even though this ISO standard is developed by experts in the field. A new working procedure will force people to change their norms and rules which have been developed after years of practical experience. In other words not everybody is willing to commit and work according to this ISO standard. In consequence,

uncertainty concerning acceptance and successful implementation of such standard exists among introducers and implementers of changes in engineering organizations.

In the literature, this willingness is called organizational change readiness or organizational readiness for change regarding people's psychological state of being ready for action. In literature Armenakis, Bedeian (1999) argue that every change effort starts with people, it is supported or resisted by people. So by focusing on people, at this point in a potential change timeline, seems reasonable choice of assessing readiness. According to PMI's hand book, organizational readiness for change is a critical step in the process of managing changes within organizations. As stated in PMI's (2013) practical guide, "Managing Changes in Organizations", in the process of "moving a strategic priority to a successful implemented and well-sustained new operational reality the assessment of change readiness is carried out in the management of the program and project portfolio even before the change is fully scoped"(p.20). Figure 3 shows the proposed change steps in PMI's handbook. So, before making any choices regarding planning and development of changes, change readiness assessment of organizations to accept such a change is a prerequisite step.

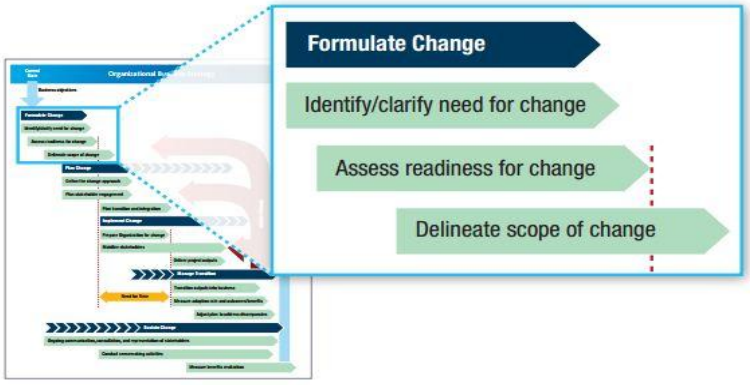


Figure 3: Change life cycle framework

1.1.3 Organizational Change Readiness Theory

Weiner (2009) in his theory "treats organizational readiness as a shared psychological state in which organizational members feel committed to implementing an organizational change and confident in

their collective abilities to do so. This way of thinking about organizational readiness is best suited for examining organizational changes where collective behavior change is necessary in order to effectively implement the change and, in some instances, for the change to produce anticipated benefits"(p.1). In this research organizational readiness for change is tested according to Weiner's (2009) theory. Weiner (2009) argues that there is a necessity for consistent theory on organizational readiness for change, so he attempts to form a theory on the topic. He argues that organizational readiness for change is composed by the commitment to change and change efficacy. In this research change commitment is explored because it is related only to people's psychological state of being ready to act. Change commitment is claimed to be composed by three components (Check chapter 2 for the explanation of these components): (1) affective (want commitment), (2) continuance (need commitment), and (3) normative commitment (obliged commitment). Also, Weiner claims that some organizational change readiness factors can craft a message for change and increase the readiness for change. These factors, collectively named as change valence, could be the solution to increase commitment and readiness for change.

1.2 Research Aim & Objective

The engineering company desires to adopt the ISO 15288, but the integration of this standard in the organization is a disputable and unpredictable effort with regard to how much employees are willing and feeling engaged to follow that norm. The problem becomes how the organization can measure that readiness and potentially influence the successfulness of the change. Therefore, in order to assist the company in this big step, the problem in this research becomes the lack of tested and consistent theory of organizational change readiness. Organizational readiness for change is the central notion in this research, but the focus is on the relationships of change valence and change commitment constructs. The aim of this research project is to test the void in organizational readiness theory dealing with the issue of change valence and change commitment as proposed by Weiner (2009). The research objective is to partly investigate the proposed theory by trying to test the positive or negative relation between change valence and organizational commitment for the introduction of standardization in this company.

1.3 Research Questions

Two main research questions and two respective sub-questions are set:

1) To which extent the organization is ready to implement a new change in the design process based on ISO15288?
   1.1) What is the score of the change valence constructs in the organization?
   1.2) What components of commitment do score positively or negatively in the organization?
2) How could the organization influence the organizational change readiness through change valence constructs?
   2.1) How strong correlations are observed among all change valence constructs and commitment components?
   2.2) What are the change valence constructs that can influence commitment components?

1.4 Research Approach and Strategy

The nature of approach is deductive. Deductive approach first develops a theory and hypothesis (change valence constructs cannot predict change commitment components), and then tests the theory based on a chosen strategy. The researcher searches for theoretical and measurement models on the concepts of change commitment and change valence. For this purpose an online search is conducted via scopus and google scholar. The goal of the search is to find a theoretical model which has been used by other researchers therefore being acceptable from the scientific community. The researcher does not search only for theoretical models but also for the associated measurement models. The aim is to find a measurement model that is validated regarding the effectiveness to measure the underlying concepts. The researcher uses references from Weiner's (2009) theory to find the aforementioned models. These models are described in chapter 2.

Question (1) is answered via qualitative and statistical research while question (2) via statistical research only. Data for qualitative and statistical research is gathered in a Dutch engineering company.

Survey is used as a strategy for collecting data to test the theoretical model. It is a reasonable choice for collecting large number of data from a population. Survey has the form of on-line questionnaire and is distributed via email to the Rail department in Amersfoort, in which this research is contracted. The original sent email as well as a reminder email is in appendix E.

Questionnaire's form is Likert-scale questions. These types of responses are useful when measuring opinions, feeling, attitudes etc. Due to the unobservable nature of the used constructs the measurement scale is not objective. Most common form is a statement on which responses of gradation agreement or disagreement are given on various scales from 1 to 5 or 1 to 7 or even larger. Table 2 shows the used scale in this research.

Scale	Acceptance Degree
1	Fully Agree
2	Agree
3	Slightly Agree
4	Undecided
5	Slightly Disagree
6	Disagree
7	Fully Disagree

Table 2: Likert response gradation

Responses are analyzed based on ordinal and interval interpretation of data variables. That discrimination causes different types of applied analysis. Ordinal interpretation entails only quantitative analysis (or non-parametric statistical analysis) and report of findings whereas interval interpretation allows parametric statistical analysis.

The difference between interval and ordinal interpretation is the assumption that the differences between acceptance scales are not the same i.e. from fully agree to agree or agree to slightly agree. More specific, in interval interpretation we assume that distances in psychological aspects between choices are equal. That allows us to analyze data in a more mathematical way even though academics argue that that interpretation can lead to misleading information (Allen, Seaman, 2007). More information about Likert data and the correctness of measuring unobserved constructs via this type of method is presented in chapter 4. In addition, used questions and relevant information about them can be found in appendix B.

1.5 Structure of Report

Report is composed in 4 chapters. Chapter 2 describes the development of the theoretical model, focusing on change commitment and change valence topic. That theoretical model is used as a frame for exploration of theory in organizational change readiness. Chapter 3 focuses on analyzing and presenting data on the aforementioned topics. Chapter 4 is the conclusion chapter in which the whole process and results are concisely presented, limitations are discussed and some recommendations are given.

Chapter 2: Theoretical Model of Organizational Change Readiness by Commitment and Change Valence

Chapter 2 aims to describe theory of organizational change readiness by focusing on the psychological aspects of being ready to take action. In the section 2.1 (Organizational Change Readiness) a theory is presented. In sections 2.2 (Organizational & Change Commitment) and 2.3 (Change Valence), literature study of the concepts is presented and discussed in order to develop a theoretical model and find a measurement model for each concept. The summary section presents all information in a visualized model. This model is tested in the following chapter 3.

2.1 Organizational Change Readiness (OCR)

In this subchapter, what is meant as organizational change readiness is explained. First the complexity of this construct is described and then organizational change readiness is defined and decomposed into elements.

2.1.1 What is Organizational Change Readiness?

Organizational change readiness is a multi-level and multi-faceted construct (Weiner, 2009). Multi-level construct indicates that readiness can be present in various levels of analysis. Those levels range from individuals to organizations with all intermediate levels like groups, units or departments. Multi-faceted construct points the various points of view in analyzing the readiness. Weiner (2009) describes readiness as a psychologically state of affairs, while others describe it as more construct means. Lehman, Greener, Simpson (2002) describe readiness as in terms of motivational readiness, institutional resources, staff attributes and organizational climate.

Unlike individual readiness for change, organizational readiness for change has not been subjected to extensive empirical study. Unfortunately, simply calling for more research will not do. As two recently published reviews indicate, most publicly available instruments for measuring organizational readiness for change exhibit limited evidence of reliability or validity (Weiner, Amick, & Lee, 2008). At a more

basic level, these reviews reveal conceptual ambiguity about the meaning of organizational change readiness and little theoretically grounded discussion of the determinants or outcomes of organizational readiness. In the absence of theoretical clarification and exploration of these issues, efforts to advance measurement, produce cumulative knowledge, and inform practice will likely remain stalled (Weiner, 2009).

As already mentioned, organizational change readiness is a prerequisite and important step in the process of implementing changes within organizations. Readiness is highly subjective notion. When assessing readiness, some terms like scope, degree and in whose eyes assessment is carried out should be kept in mind during and after assessment completion.

For whom and what: Combe (2014) says that in current research on the readiness topic two points emerge. One point is that organization is assessed by the organization's financial, material, human, and information resources which can be used in implementing change, while the second point of view discusses the psychological willingness of affected people to bring successfully a change. Combe (2014) states that these points of view are not commonly brought together.

If the change is large in scale, then readiness should be assessed at several levels. Obviously different points of view will reveal different readiness results. Proponents of change are more open to adapt their mindsets in coming situations in contrast to opponents. Therefore the question "for whom readiness" is very crucial when assessing readiness for change. Combe (2014) states "much of today's commercial assessment of readiness does a decent job of looking to the opinion of those most closely affected by the change, but it may neglect a complex environment of interlocking relationships and operating norms that requires a more holistic assessment"(p.5).

2.1.2 Elements of Organizational Change Readiness

Change readiness is a measure of confidence, backed by defensible data and information. This concept acknowledges that readiness is a perception and is measured both by judgment and by more structurally sound data (Combe, 2014). Combe (2014) considers three key driving elements to assess

readiness for change. Those are (1) cultural readiness, (2) commitment readiness, and (3) capacity readiness (Figure 4).

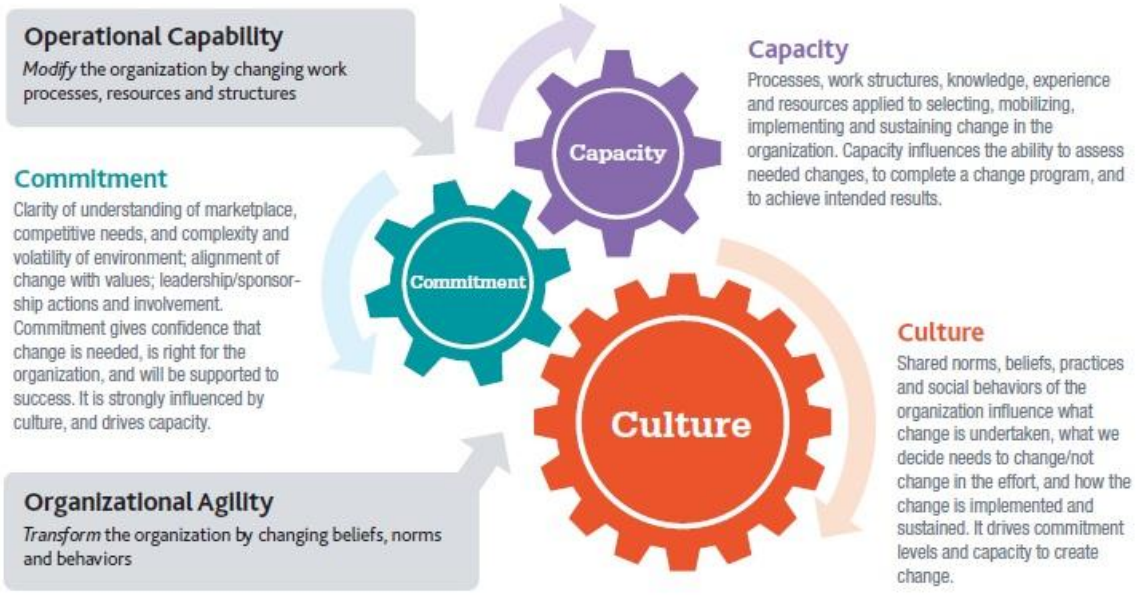


Figure 4: Drivers of organizational change agility (Combe, 2014)

Weiner (2009) describes organizational readiness for change as two facets, organizational commitment and efficacy, as conceptually interrelated and correlated according to his opinion. Figure 5 depicts his whole theory of organizational change. In both models culture is the gearing point of change successfulness. Culture is the principal construct responsible for creating or leveraging readiness for change. In Figure 5, culture can be found in the first box, while in Combe's model it is the biggest gear. Also commitment and capacity can be found in both models. In Combe's model, commitment is defined by a number of notions, like understanding martketplace, competitive needs, leadership support, confidence, right for the organization to change etc. While in Weiner's model commitment is a concept that brings and creates readiness level influenced by external factors very similar to Combe's model. The difference is that Weiner defines these constructs as change valence factors and suggests change commitment to be studied alike. The aforementioned models look very similar regarding commitment and capacity/efficacy. Therefore, by definition change commitment and efficacy are two aspects of

organizational change readiness. High change commitment and efficacy levels entail more ready organization for change.

In Weiner's theory, organizational commitment and efficacy are described as context dependent factors. More specifically, Weiner claims that some organizational features create a friendly context to accepting changes, while this context is necessary not always sufficient to create readiness. That means a change creating receptive context will not necessarily be accepted by the organization due to the low readiness for that change. For instance, considering an organization with high risk-acceptance values, from two risky proposed changes one can be accepted and the other rejected due to the content of change.

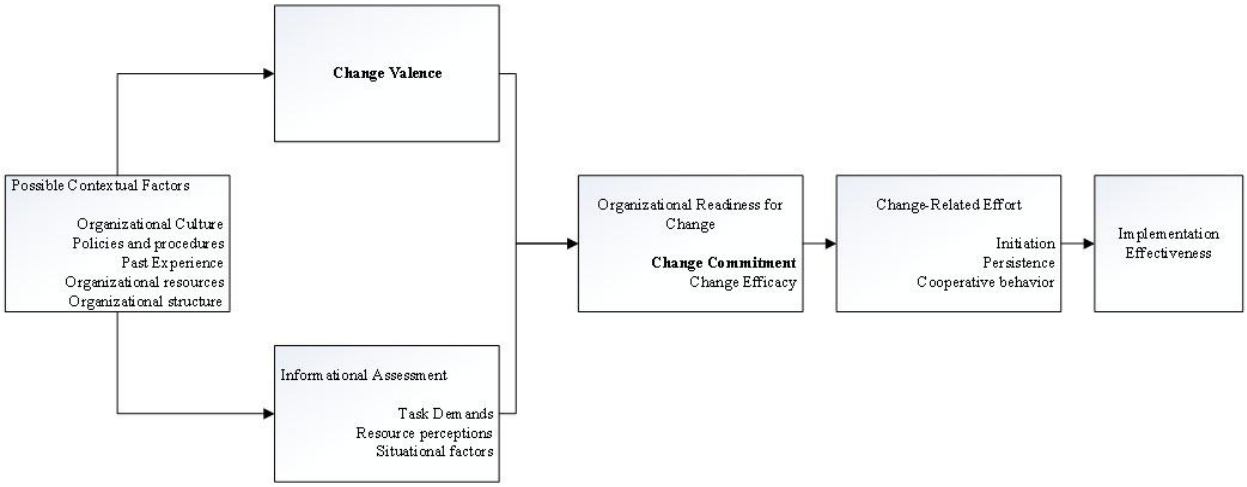


Figure 5: Determinants and outcomes of organizational readiness for change(Weiner,2009)

Change commitment and efficacy are partly content related too. In other words, it is not enough to create a friendly context but the change itself should be attractive to people. Commitment and efficacy as already mentioned are interrelated. Bandura (1997) notes, low level of confidence might entail low level of engagement in action courses, and Maddux (1995) notes that fear and negative motivational states can lead one to underestimate his capabilities to perform and implement actions. The content of change, as we see, is an important factor in assessing readiness to change.

Commitment and efficacy are both referred as collective notions towards shared resolve to pursue actions and shared beliefs in capability to execute and organize actions respectively, due to the collective nature of implementing changes (Weiner 2009). Efficacy is "a function of organizational members'

cognitive appraisal of three determinants of implementing capability: task demands, resource availability, and situational factors" (Weiner 2009). In conclusion, Weiner claims that change commitment is influenced strongly by change valence factors while change efficacy by informational assessment. Weiner suggests that commitment originates from the value people put on specific change. This value can be altered if change valence factors can be altered as well. This research, as mentioned, focuses on the test of the connection between change commitment and valence. Figure 6 shows the context of the proposed connection.

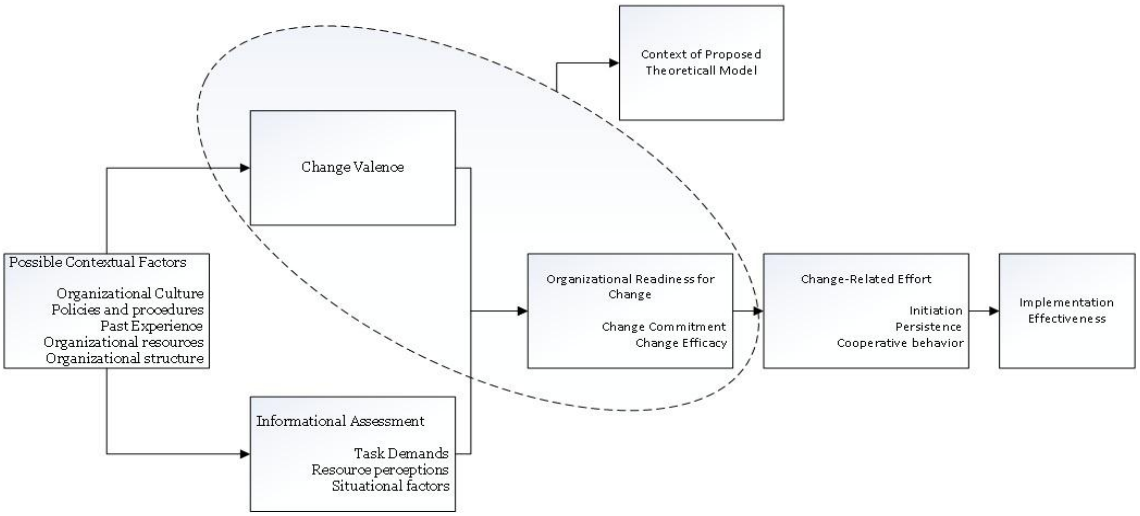


Figure 6: Context of proposed theoretical model within Weiner's theory

2.2 Commitment

In this research, both change and organizational commitment are described but only change commitment is measured. This description aims to inform the reader about the study from which change commitment originates. As explained later in this section, change commitment structure and its basic concept originates from organizational commitment, therefore looking very similar but is not the same. After conducting some online searches via Google Scholar and Scopus the most frequently referenced model was Meyer's & Allen's (1991) and Herscovitch's & Meyer's (2002) models. This is the main criterion to choose this model. Variations of this model exist in literature but researcher did not study any of those.

2.2.1 What is Commitment

Organizational Commitment is the individual's psychological attachment to the organization, playing an important role in determining whether employees will remain engaged to organization goals. It is commonly believed that committed employees will exert more effort and work harder to fulfill organizational objectives. Organizational commitment is a variable well studied by many experts in organizational studies (check next paragraph). The basic idea was to find ways of improving how people feel about their jobs and increase the commitment people feel towards their organizations. Organizational commitment is described as a wide key factor between individuals and organizations. (Sharma, Bajpai, 2010).

In order to better understand what causes strong or weak commitment, researchers tried to map factors influencing commitment levels. Some examples, among many are the following: Antón (2009) found that commitment is negatively related to role stress mediated through job satisfaction. Song (2011) found that in engineering enterprises when being under organizational changes role stress will lead employee to reduce organizational commitment and job involvement of the staff. Qiao, Sun, Liu (2007) confirmed that empowerment has effects on employee's organizational commitment via psychological contracts. Fatima, Iqbal, Imran (2013) found that empowerment is significantly and positively associated to commitment. Numerous other variables which influence or influenced by commitment can be found in the literature. Therefore, organizational commitment should be considered as an important psychological attachment to the organization, requiring gentle treatment due to multi-influences from other variables.

2.2.2 Theory & Components of Organizational and Change Commitment

Meyer and Allen (1991) conceptualized commitment into a three component model (see below: A Three-component Commitment Model). Meyer and Allen (1991) note: "Common to these three approaches is the view that commitment is a psychological state that (a) characterizes the employee's relationship with the organization, and (b) has implications for the decision to continue or discontinue

membership in the organization. Beyond this however, it is clear that the nature of psychological states differ" (p.67).

Meyer's and Allen's motivation was to create a consistent measurement scale in order to aid in the interpretation of the existing literature and serve as framework for future research. They argue that their model incorporates both attitudinal and behavioral perspectives of organizational commitment. They also argue that this psychological state can reflect a desire, a need and/or an obligation to maintain membership. The next three paragraphs are describing Meyer's and Allen's commitment model.

A Three-component Commitment Model

Affective Commitment: Refers to the emotional attachment of the employee to the organization and his involvement in the organization. It is characterized by a strong desire (desired based commitment) to maintain relationship, willingness to put extra effort for the sake of the organizations. That stems due to aligned values between employee and organization as well as desire to commit to organization's goals. So in other word employees with high affective commitment *want to* stay in the organization. In the literature it has been associated to work experiences, individual traits and organizational structures.

Continuance Commitment: Refers to awareness of costs associated when leaving the organization. Employees with high levels of continuance commitment feel the *need to* (cost-based commitment) stay in the organization. For instance employees might be afraid to leave an organization because there is high unemployment rate in the relative market, or there are strong emotional relations with co-worker. In more simple words employees are taking into consideration all associated risks and sacrifices when leaving.

Normative Commitment: Reflects the obligation of employees to stay in the organization. Employees with high level of normative commitment feel that they *ought to* (obligation-based commitment) continue employment. Employees in that case feel moral obligation to do so. Therefore it is the level when people are psychologically associated with organizations visions, missions, goals and values.

Tests of the model showed internal consistency of affective, continuance and normative scales to range from 0.74 to 0.89, 0.69 to 0.84 and 0.69 to 0.79 respectively (Meyer and Allen, 1991). That means

all used items/questions are scoring approximately the same and on the proposed construct. The tests showed significant correlation between normative and affective scale (r=0.51) while continuance scale showed weak correlation with affective (r=0.06) and normative (r=0.14) scale (Meyer 1991). That suggests that feelings of what someone wants to do are not independent from what he ought to do.

Meyer and Allen (1991) believe that it is better to understand and consider affective, continuance and normative commitment as components of commitment rather than types of commitment. That implies that people should not necessarily belong only in one group. People might experience all these forms of commitment to varying degree.

Research showed people scoring high on affective commitment scale tend to perform at a higher lever from those scoring low on the same scale. The same conclusion is valid for the normative commitment scale, but the effect on performance is not that strong as for desire. People, who afraid to lose something of value, do not stimulate themselves to do something extra of what is required.

In this research, the extension of the aforementioned three-component organizational commitment model is used, suggested by Herscovitch and Meyer (2002). The choice is only due to the wide acceptance and application in academic research although subjected to some criticism.

Herscovitch and Meyer (2002) suggested a change commitment model based on Meyer's and Allen's (1991) organizational commitment model. This means change commitment is defined as a three component model too. The components are very similar to organizational commitment with the difference that the commitment is addressed to a change than to maintain membership. Therefore, first component is the desire/want (affective) to stay committed, the second is the need (continuance) to stay committed and the last is the obligation (normative) to stay committed. Although some researchers in the past suggested that commitment to change is a unidimensional construct, this work is the first attempt to categorize commitment to change. A new commitment definition is given in order to make commitment model applicable to any context.

Commitment to change is defined: as a force (mind-set) that binds an individual to a course of action deemed necessary for the successful implementation of a change initiative. The mind-set that binds

an individual to this course of action can reflect (a) a desire to provide support for the change based on a belief in its inherent benefits (affective commitment to change), (b) a recognition that there are costs associated with failure to provide support for the change (continuance commitment to change), and (c) a sense of obligation to provide support for the change (normative commitment to change).

In Herscovitch's and Meyer's (2002) studies, an educational institution was studied (N=224) for the preliminary validity of the model on a student population. In the second and third study, hospitals were used (N=157, N=108 respectively) for further validity of the model on nurse populations. That entails potential reuse of the model in different organizations and population. Factor analysis clearly reflected affective, continuance and normative commitment. Table 3 shows factor analysis results. Correlations among factors were modest. Affective Commitment factor correlated -0.03 with the Continuance Commitment and 0.24 with the Normative Commitment factor. Continuance and Normative Commitment factors correlated 0.41. Particularly alpha coefficients (Cronbach's alpha) for the six-item Affective, Continuance, and Normative Commitment to Change Scales were 0.94, 0.94, and 0.86 respectively, showing high reliability of the test. The six-item scales are presented by Table 3, where each commitment component is composed by 6 questions/items.

Item	Factor I	Factor II	Factor III
Affective commitment items			
1. I believe in the value of this change.	−.01	**.91**	.22
2. This change is a good strategy for this organization.	.02	**.93**	.25
3. I think that management is making a mistake by introducing this change. (R)	−.13	**.83**	.12
4. This change serves an important purpose.	−.09	**.91**	.23
5. Things would be better without this change. (R)	−.11	**.81**	.23
6. This change is not necessary. (R)	−.04	**.78**	.33
Continuance commitment items			
1. I have no choice but to go along with this change.	**.87**	−.03	.36
2. I feel pressure to go along with this change.	**.76**	−.08	.32
3. I have too much at stake to resist this change.	**.93**	−.03	.32
4. It would be too costly for me to resist this change.	**.87**	−.05	.28
5. It would be risky to speak out against this change.	**.82**	−.06	.31
6. Resisting this change is not a viable option for me.	**.89**	.03	.36
Normative commitment items			
1. I feel a sense of duty to work toward this change.	.28	.22	**.82**
2. I do not think it would be right of me to oppose this change.	.47	.31	**.69**
3. I would not feel badly about opposing this change. (R)	.24	.23	**.65**
4. It would be irresponsible of me to resist this change.	.38	.15	**.58**
5. I would feel guilty about opposing this change.	.32	.12	**.76**
6. I do not feel any obligation to support this change. (R)	.19	.21	**.79**

Note. Oblimin rotation was performed. Each item's highest loading is presented in boldface. Eigenvalues and percentage of variance accounted for by Factors 1, 2, and 3 were 6.05 (31.80%), 4.91 (25.91%), and 2.15 (9.97%), respectively. R = reverse scored.

Table 3: Factor analysis of commitment to change items (Study 1) (Herscovitch and Meyer, 2002)

Responses were collected on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

2.3 Change Valence

In this sub-section the change valence concept is described and decomposed into sub-elements. The outcome of this sub-section is again a measurement model regarding sub-elements of the change valence concept.

2.3.1 What is Change Valence

In chemistry, valence is defined as the combining power of an element. Similarly, Weiner (2009) defines change valence as "a parsimonious construct that brings some theoretical coherence to the numerous and disparate drivers of readiness"(p.69). Business Dictionary defines valence as "negative or positive psychological value assigned by a person to another person, event, goal, job, object, outcome,

etc., based on its attractiveness to him or her". Weiner notes, like discussed in the literature, that people value change for several different reasons with different points of view. He states that "it is unlikely that any of these specific reasons will exhibit consistent, cross-situational relationships with change commitment"(p.70). He also states though that "change valence resulting from disparate reasons might be just as potent a determinant of change commitment as change valence resulting from commonly shared reasons"(p.70). But an interesting question arises regarding the level of analysis when assessing organizational change readiness. Like, Armenakis, Bedeian (1999) and Cole, Harris, Bernerth (2006) concluded that changes are initiated with individuals as well as supported or resisted by individuals either via ultimate decisions or behaviors. Supported changes indicate higher levels of commitment and higher readiness for change in contrast to resisted changes.

2.3.2 Change Valence Constructs

This sub-section presents factors that compose and affect change valence construct. After studying the literature, the most usual constructs influencing the psychological state of employees are presented.

Armenakis, Bedeian (1999) in their work are presenting five key change message components applicable, according to their opinion, to all transformational efforts which can increase the value people set in a change. They feel that most of the negative organizational change responses are caused by a lack of important and consistent communication of change messages. They argue that change messages can be exploited to provide an organizing framework for creating change readiness. Due to the definition Weiner is giving to change valence, the above statement shows that there are components or factors of change valence that can increase readiness. This is also the interesting point of this research since it focuses on the effect change valence variables can bring to change commitment which is part of the change readiness.

The five key message domains are: (1) Discrepancy, (2) Change self-efficacy, (3) Appropriateness, (4) Principal Support, (5) Personal Valence (Armenakis and Bedeian, 1999).

Discrepancy: Addresses the sentiment of change need. This can be achieved mostly by demonstrating how current performance differs to desired performance. Employees must be convinced that there is something wrong in the way they work so change is inevitable for being successful.

Change self-efficacy: Closely related to motivational theory, it refers to sentiments regarding confidence. People (not organizations) will attempt a change to the extent they feel confident.

Appropriateness (Organizational Valence): Individuals might believe that there must or not be a change, so they agree or disagree with a proposed one. The more beneficial the change looks for the organization and the more clearly the need for change is addressed, the more appropriateness is crafted. So their reaction is intentionally decent and can be potentially beneficial for the organization.

Principal Support (Leadership Support): This concept is related to the clear support and commitment of the management team to the proposed change. The more commitment and support is shown from leaders and managers, the more positively affected employees will be. Possibly senior employees have seen change attempts being stall in the past without clear demonstrated support by managers or operators. Consequently they might be skeptical and unwilling to commit themselves to change before any form of support is clearly made.

Personal Valence: Numerous employees will ask "What is in it for me". They will look for the distribution of positive and negative outcomes and how fair change is. If self-interest is threatened then possibly individuals will resist to that change.

Cole, Harris, Bernerth (2006) presented change sentiments as "Vision Clarity", "Appropriateness" and "Execution". In their work vision clarity is strongly related to need for change, similar to discrepancy of Amrenakis (1999), and their study is based on Armenakis's proposed key domains.

Holt, Armenakis, Field, and Harris (2007) in their work emphasize the need for an instrument measuring change valence construct. They address the lack of an instrument measuring several perspectives. These perspectives (Figure 7) should be addressed by one comprehensive instrument, like suggested by Holt et al. (in press). In the below Figure 7, an ideal model of perspectives of readiness for change is shown, content refers to what is being changed, process refers to how the change is being

implemented, context refers to circumstances under which the change is happening, and individual attributes refers to characteristics of people being asked to change. All these perspectives should be included in a comprehensive change valence measurement model. As stated by Holt et al (2007) these perspectives "are suggesting a general set of beliefs shaping readiness and provide the foundation for resistance or adoption behaviors". Unfortunately this conceptual framework hasn't been tested by the researchers but only assisted in creating a comprehensive measure. Holt et al (2007) in their attempt to develop a scale renamed some parameters but they kept given meanings the same i.e. Efficacy as Confidence, Appropriateness as Organizational valence and Principal Support as Senior Leadership support.

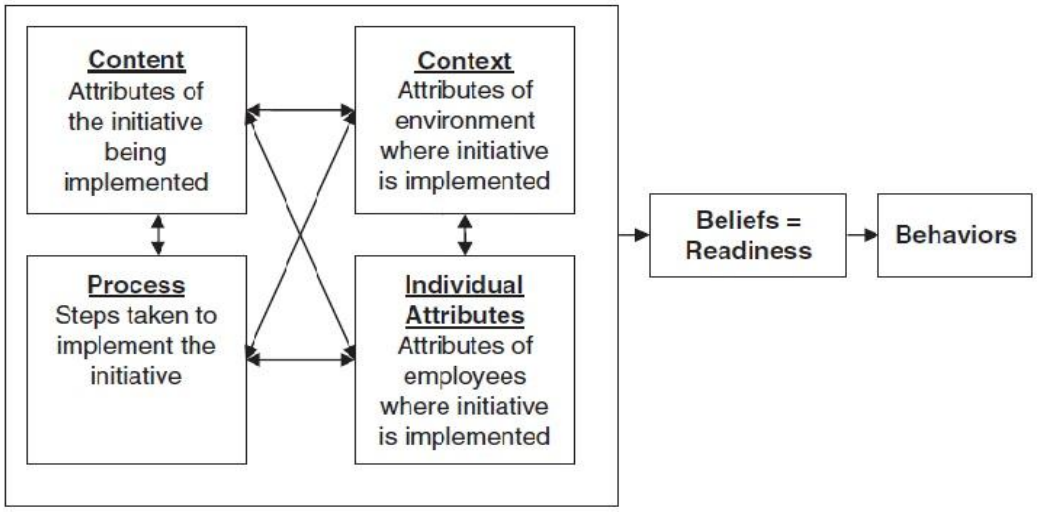


Figure 7: The relationship between content, process, context and individual attributes with readiness

Holt et al (2007) developed an organizationally relevant and change specific scale instrument, based on Armenakis' theory, to assist managers and consultants to assess the readiness of an organization towards changes, by measuring constructs associated to messages for change. The analysis showed some unexpected results. In their analysis people cannot separate the notions discrepancy and appropriateness (or organizational valence). In other words, factor analysis showed one construct for variables addressing discrepancy and appropriateness (organizational valence). Thus they clustered these variables into one construct (factor 1), adding three more variables (questions) addressing personal beneficial domain which scored high in factor 1. Table 4 shows factor analysis results. We see that questions 1, 4 and 10 were

originally labeled as organizational valence variables. Also questions 2, 3, 5, and 9 were originally labeled as discrepancy variables. Finally questions 6, 7, and 8 were originally in personal valence construct.

Pattern Matrix					
Questions	ORF[1]	1	2	3	4
Factor 1: Appropriateness					
1. I think that the organization will benefit from this change	OV	**.95**	-.13	-.02	-.07
2. It doesn't make much sense for us to initiate this change	D	**.90**	-.07	.04	-.03
3. There are legitimate reasons for us to make this change	D	**.84**	-.11	.03	-.19
4. This change will improve our organization's overall efficiency	OV	**.83**	.00	.03	.00
5. There are a number of rational reasons for this change to be made.	D	**.81**	.03	.01	.05
6. In the long run, I feel it will be worthwhile for me if the organization adopts this change.	PV	**.80**	.00	-.29	.16
7. This change makes my job easier	PV	**.78**	.12	.05	-.10
8. When this change is implemented, I don't believe there is anything for me to gain	PV	**.77**	-.02	.05	.06
9. The time we are spending on this change should be spent in something else.	D	**.71**	.04	.06	.09
10. This change matches the priorities of our organization.	OV	**.64**	.17	.05	.10
Factor 2: Leadership Support / Management Support					
11. Our senior leaders have encouraged all of us to embrace this change.	SLS	-.13	**.94**	-.06	.01
12. Our organization's top decision makers have put all their support behind this change effort	SLS	-.07	**.89**	-.01	-.04
13. Every senior manager has stressed the importance of this change.	SLS	.05	**.86**	-.10	-.11
14. This organization's most senior leader is committed to this change.	SLS	.13	**.68**	-.01	.06
15. I think we are spending a lot of time on this change when the senior managers don't even want it implemented.	SLS	.06	**.67**	.02	.10
16. Management has sent a clear signal this organization is going to change.	SLS	-.09	**.65**	.19	-.07
Factor 3: Change Efficacy / Confidence					
17. I do not anticipate any problems adjusting to the work I will have when this change is adopted.	CSE	-.07	-.04	**.85**	-.02
18. There are some tasks that will be required when we change that I don't think I can do well.	CSE	.11	-.08	**.78**	-.12
19. When we implement this change, I feel I can handle it with ease.	CSE	-.05	.01	**.71**	.06
20. I have the skills that are needed to make this change work.	CSE	-.18	-.07	**.71**	.27
21. When I set my mind to it, I can learn everything that will be required when this change is adopted.	CSE	.12	.14	**.64**	-.07
22. My past experiences make me confident that I will be able to perform successfully after this change is made.	CSE	.20	.12	**.51**	-.02

Factor 4: Personally Beneficial					
23. I am worried I will lose some of my status in the organization when this change is implemented.	PV	-.03	-.08	.01	**.88**
24. This change will disrupt many of the personal relationships I have developed.	PV	-.05	-.03	.02	**.76**
25. My future in this job will be limited because of this change.	PV	.21	.12	.06	**.53**

Table 4: Results of factors analysis of 4 change valence factors (Holt et al, 2007)

Note: D= Discrepancy; OV= Organizational Valence; PV=Personal Valence; SLS= Senior Leadership Support; CSE= Change Self-efficacy. Based on Oblimin rotation.

[1]ORF=Original Readiness Factor

Another part of the literature found to be interesting topic for relevant experts is attitudes towards proposed changes. Piderit (2000) suggested a new conceptual model for attitudes towards organizational change readiness. Therefore, we assume that attitudes can play a role in how ready an organization is to accept or reject a change. Attitudes towards a change are obviously content related but also context related. Dunham (1989) presented a relevant instrument. In his work, we see that the separation of attitudes is not very clear. Even though factor analysis revealed some sort of separation the distinction was not very clear.

On the other hand, Piderit (2000) suggested the notion of ambivalence attitudes. He suggested that an employee can belong in two or more dimension at the same time. According to Piderit (2000) the attitudes can be labeled as (1) cognitive, (2) emotional, (3) intentional. His separation was based on the arguments of early theorists. The notion of ambivalence attitudes reflects a model of attitudes similar to commitment in the sense that people can belong in all components at the same time to less or stronger degree. For this reason, as described in the next paragraphs, only cognitive component of attitudes is used.

Cognitive: “In the view of cognitive dimension of an attitude refers to an individual’s beliefs about the attitude object. In their review of the literature on the tripartite view, Eagly and Chaiken define this dimension as follows: Beliefs express positive and negative evaluation of greater or lesser extremity and occasionally are exactly neutral in their evaluative content”.

Emotional: "The emotional dimension of an attitude refers to an individual’s feelings in response to the attitude object. Eagly and Chaiken define this dimension as the feelings, moods, emotions and sympathetic nervous-system activity that people have experienced in relation to an attitude".

Intentional: This dimension is the most complex due to lack of validated empirical results. Some researchers found that there are only two dimensions. Others who found a third dimension labeled it inconsistently. In the tripartite view the third dimension is reflecting the evaluation of an attitude object based on past behaviors or future intentions. Some researchers according to Piderit (2000) place more importance on intentions though future intentions in some case have been treated like entirely separated constructs.

Dunham (1989) as already mentioned presented a measurement scale of attitudes. He concluded with 18 questions which according to his evidence represent three different dimensions (6 questions for each dimension). At this point, it is important to mention that Dunham notes that there must be a separation of general change questionnaire and specific change. He argues that employees' attitudes towards general change might not be good behavior predictor. An employee could be positive for general changes but negative for a specific change. Among 52 items, 18 were selected for extra analysis. They were tested on another population to show again that each question is addressing different construct. Each item was categorized in one of the attitude dimensions mentioned above. In this research only the cognitive component of attitudes is used due to the complexity of clustering and measuring attitudes.

These 18 items have been tested further on another sample. The factor analysis of the cognitive component is the following.

Pattern Matrix			
Attitude Questions	Factor 1	Factor 2	Factor 3
Most of my co-workers benefit from this change	**0.64**	0.04	0.25
I usually benefit from changes	**0.78**	0.13	0.06
Changes usually benefit the organization.	**0.76**	0.24	0.16
I find most changes to be pleasing.	**0.53**	0.32	0.06
I intend to do whatever possible to support this change	**0.74**	0.12	0.09
Changes usually help improve unsatisfactory situations at work.	**0.74**	0.27	0.12

Table 5: Attitudes towards change in general factor structure (Auto Club Sample)

Therefore, in the literature, there are two theoretical and measurement models. First model describes and measures appropriateness, leadership support, change efficacy, and personal valence while

the second describes and measures three components of attitudes (cognitive, emotional, and intentional). Only the cognitive component of this model is used in this research due to the complexity of measuring attitudes and opinion controversy by experts in the topic. We see that some researchers had studied the concepts related to change valence and all the studies look very similar to the basic idea proposed by Armekanis. Researchers try to give slightly different definitions but the essence is the same. Even if, there are slight differences in definitions, not all of them have developed or validated measurement models to adjust to the new meanings.

Both models presented are used in our analysis. Check the following chapter 3 for more details regarding the approach of the used models.

2.4 Connecting Valence with Commitment

Till now we have described the literature reflection between change valence variables and organizational change readiness. We adopt Weiner's claim that change valence variables will affect organizational change readiness through commitment. According to researcher's point of view, there are some reasons driving people to commit themselves to new changes, and the assumption made by Weiner sounds reasonable. We have found in the previous subsections that the literature shows and argues connection of change valence constructs only to organizational change readiness. So there is no direct and proven connection. There are not verified data connecting change valence constructs and change commitment. In the next paragraphs, the researcher tries to explain that connection, and test that assumed connection. Through this tested connection, the influence of each change valence constructs is better explained on how they can influence readiness through commitment.

The researcher believes that appropriateness is the most important factor when new changes are going to be addressed. The need for a change is highly valued by people and can motivate people in staying committed. People who care about the organization, probably mostly senior employees, feel that concern more intensively than new employees, will follow and commit to a change for the sake of the organizational success. By creating clearer message of how the change will benefit, people caring the

organization will stay committed because they want to do so. Also less senior people will follow because they understand that if organization fails to change then there will be damages or troubles for them as well. These damages or troubles motivate need for commitment. In the last component, only people who really go in line with organizations visions and goals will stay committed due to the psychological attachment to it.

Leadership support is the second most important construct according to the researcher's personal opinion. Better leadership communication and support will result in high levels of commitment. People who want to stay committed because they want to, will do so if leaders will address their own reflections and beliefs on the topic, but not top managing requests. Also, when leaders have charisma and inspire people to follow them, then desire for commitment is created. Fear could be the main motivation for creating more cost-based and obligated commitment. Employees could fear or feel threatened from leaders to follow changes because of potential loss of employment (obligation) or for creating better context for career development (need). The obligation for change is obviously content related. An obligation of change from IT managers is not the same as an obligation of change from health care quality managers. People will change faster to IT changes than health changes.

High confidence in implementing a new change will create more desire to stay committed. When people know they will succeed in one or another way that makes them stay committed. While low confidence will make people frustrated and will lead only to obligation or need in continuing the change.

Cognitive component of attitudes plays a role in the beliefs people can shape about a change. Obviously beliefs can partly reflect the component of commitment dominating over individuals. For instance, whether an individual finds a change nice and pleasant then obviously these feelings reflect desired commitment. Bad beliefs, due to possible several reasons, reflect obligation or need for change.

Personal benefit as mentioned, addresses potential disrupted relations and personal benefit from a change. If a change manager could prove that with a new change new opportunities or developments will occur, then possibly employees will feel the desire to commit. On the other hand, if for instance, all employees tend to change but an individual feels reluctant to change then the power of the mass will lure

him/her to follow. Being isolated in that sense will not make him/her feel comfortable, therefore he/she will change due to obligation or need. Also disrupting relations will bring a gap between colleges. This gap could lead to less communication and eventually less learning on the job. Limiting the capacities of an individual, will create need for commitment to change.

2.5 Conclusions

From literature theory, before Weiner's attempt to construct a theory, there have been some drivers (change valence constructs) of organizational change readiness capable to influence and alter the readiness of an organization to change. According to researchers in the literature, these constructs are influencing only the organizational change readiness. Weiner (2009) brings some coherence to these drivers by calling them change valence constructs. In the above sections these contructs have been presented.

In addition, Weiner (2009) defines organization change readiness as two facets, change commitment and efficacy. He claims that when change commitment and efficacy increase then organizational change readiness do so. He also claims that commitment is influenced by change valence constructs while change efficacy by informational assessment. Therefore, in conclusion, he claims that all these change valence constructs first influence commitment and consequently by definition organizational change readiness increases or decreases.

Regarding the theoretical and measurement models, the literature shows 3 theoretical models. The first model by Herscovitch and Meyer (2002), the commitment model, is composed by three components: 1) affective (desire for commitment), 2) Continuance (cost-commitment), 3) Normative (obliged-commitment). Herscovitch and Meyer (2002) conducted factor analysis on a set of 18 questions to measure each component (6 items for each component). The results show a reliable model for further research. In the change valence concept, literature shows 2 theoretical models. Attitude model by Dunham (1989) and another model by Holt et al (2007) on appropriateness, leadership support, change efficacy, and personal benefit constructs. Both developed measurement models with 6 (Dunham, 1989)

and 25 (Holt et al, 2007) questions/items, and conducted factor analyses Results show reliable measurement models.

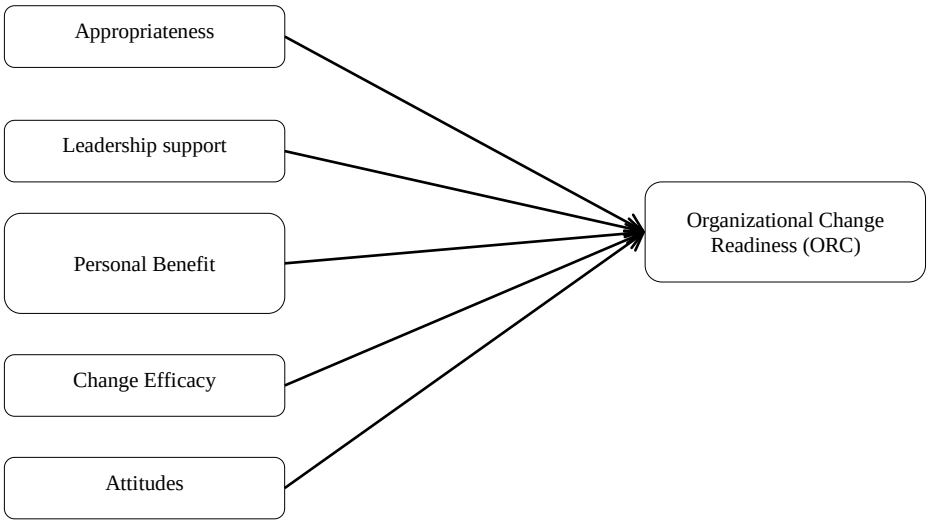


Figure 8: Factors affecting organizational change readiness before Weiner theory

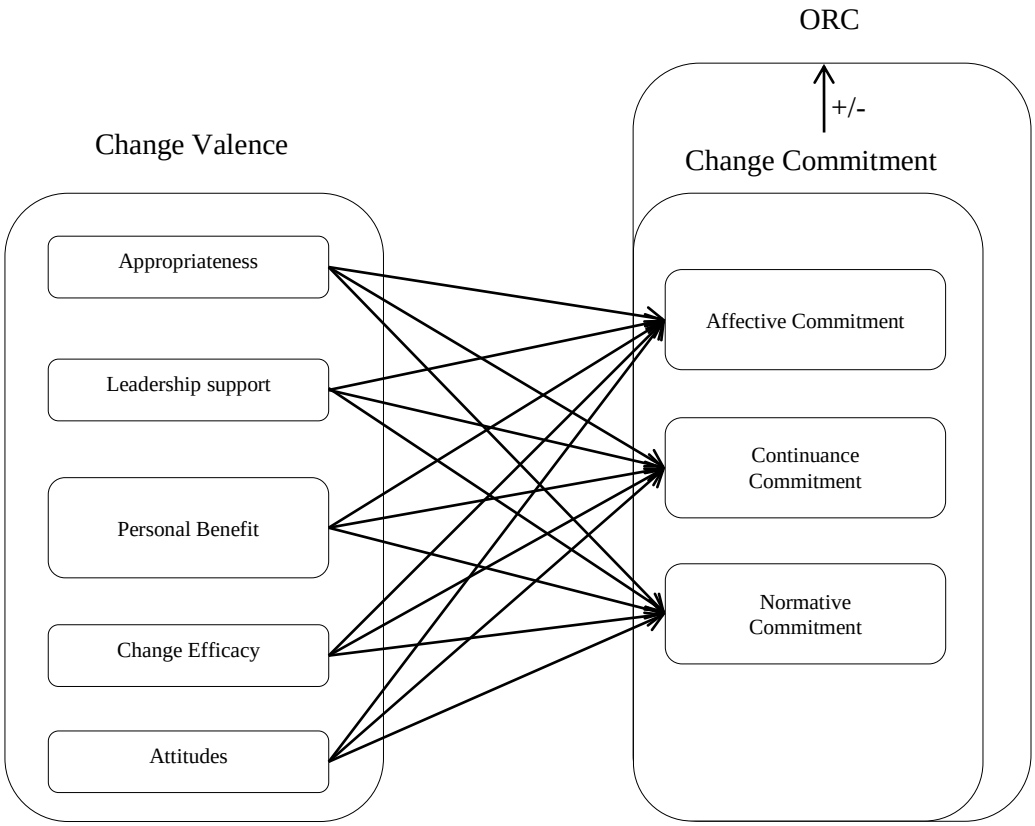


Figure 9: Theoretical Model

Chapter 3: Data Analysis & Report

Chapter 3 aims to present all data gathered and analyzed. In section 3.1 (Approach & Limitation) methodologies and assumptions regarding analyses are presented. Section 3.2 (General Outcomes) presents some general results on the responses of all 49 questions (check appendix B) before executing any parametric statistical analysis. Section 3.3 and 3.4 focus on the analysis and presentation of the commitment and change valence models respectively. Finally, section 3.5 focuses on the regression analysis between change commitment and valence.

3.1 Approach & Limitations

As described in the previous chapter, three measurement models are adopted in this research. One measurement model is the commitment model and two separate models setting up the change valence model. Both models are used as guidelines to reduce the number of variables on the data gathered but also had been tested on other population as shown in the chapter 2. That means data are used for factor analysis and outcomes are expected to be close to the literature outcomes. Then, after reducing the number of variables, factor results are used for regression analysis between the change commitment and change valence. More details about measurement models and regression model are found in the following sections 3.3, 3.4, and 3.5.

For the sake of presentation, controlling, and simplicity reasons, all questions have been given an index Xi where i range from 1 to 49. Questions addressing commitment construct are labeled with numbers 1 to 18. Change valence questions have been labeled with numbers 19 to 49. The complete modified questionnaires can be found in appendix B. For the sake of this research project, questions are modified by replacing "this change" with "this standardized design process". Even though this change is related to systems engineering using that term might be misunderstood and misinterpreted by people in different ways. Engineers who haven’t had any experience before, probably need an introduction to the theory of SE and the potential application benefits. On the other hand, managers are more familiar with the theory and its application.

Additionally, all English written questions have been translated to Dutch language. That effort was made mainly for reasons of efficiency. Researcher believes that even though employees acknowledge English language, Dutch written questions are always more convenient and faster to be answered. But unfortunately, translation action conceals problems of cultural differences and aspects. Within the scope of this research such problems are ignored. We assume that Dutch text transforms the same underlying notions as English text would do and also creates the same communication. The real created communication stands somewhere between our assumption and the fully successful notional transformation. Girter (2002) states "the process of transformation results in a creation of a hybrid text"(p.27). She also mentions, "hybrid text can be described as a product of a compromise between two or more cultures"(p.27). Our assumption is not far away from truth because translation issues arise mostly when humor, rituals or religion is involved. Our translation is tremendously close to the original text.

Finally, data are in the form of Likert-scale responses because questions have been developed alike. Theory of Likert-scale data is in appendix C (sections 4 & 5), for whom interested reading. The main limitation of Likert-scale data is the controversial acceptance of data interpretation as interval data, which is required for parametric analysis. Academics claim that interval interpretation of Likert-scale data can mislead results (Allen and Seaman, 2007). On the other hand some academics claim that when sample size is large enough, at least 5 to 10 observations per group, then parametric tests can be used (Artino, Sullivan, 2013).

All 198 employees in the Rail department have received an email (check appendix E) with the survey link. After 7 working days, the total number of responses was 79, and an email reminder (check appendix E) has been sent to all employees. After three working days responses were 123. In the time between the first email and the closing day, people have asked questions about several topics. Few topics were irrelevant to the purpose of the research, although some questions addressed the meaning of the standardization. In the last case, researcher tried to describe as accurately as possible the idea and methodology of the ISO 15288 standard.

3.2 General Outcomes

3.2.1 Background Information

Some background information regarding population has been collected through the survey. Respondents have been optionally asked to fill information concerning their gender, role, years of experience and group. Below Table 6 shows the aforementioned discrimination.

Category	Discrimination	Total responses per category	Percentages per category (%)
Gender	Man	108	87
	Woman	15	13
Role	Trainee	10	8.1
	Designer	21	17
	Senior Designer	6	4.8
	Specialist	17	13.8
	Senior Specialist	16	13
	Advisor	11	8.9
	Senior Advisor	14	11.3
	Assistant project leader	8	6.5
	Project leader	11	8.9
	Project manager	3	2.4
	Execution supervisors	5	4
	Department Director	1	0.8
	Market Director	0	0
Years of working experience	Less than 2	16	13
	3 to 5 years	16	13
	6 to 10 years	36	29.2
	11 to 15 years	18	14.6
	More than 16 years	37	30
Group	Studies & Counseling	19	15.4
	Spatial Design	34	27.6
	Studies & Signaling	41	33.3
	Construction & Asset Management	29	23.5

Table 6: Background data discrimination

Data population reaches 123 (62%) out of 198 people. Noticeably, replies come from all groups and all types of employees. Number of project managers and execution supervisors is low, only 3 and 5 respectively. Researcher assumes that working experience is positively related to age, so the older someone is the more working experience he/she possibly has. Therefore, from data we notice experienced and no-experienced employees participated in the survey. It can be assumed that young and old population distributions are sufficiently present. Researcher assumes that data sufficiently represent the department.

3.2.2 Pre-parametric analysis

The pre-parametric analysis aim is to present the data before proceeding with any mathematical or statistical calculations of data. Bar charts are used to present responses to each question. In this simple analysis, median and interquartile range (IQR) is used to summarize the results.

Table 7 shows some core data of commitment questions. This table includes mode responses, median responses, IQR and total responses for each choice on each question. All bar chats of all questions can be found in appendix D (section 1).

Addressed Construct	Question	Mode	Median	IQR	Responses for each choice							
					1	2	3	4	5	6	7	Total
Affective Commitment	X1. I believe in the value of a standardized design process.	2	2	1	20	65	21	4	9	3	1	123
	X2. A standardized design process is a good strategy for this organization.	2	2	1	16	60	30	3	8	5	1	123
	X3. I think that management is making a mistake by introducing a standardized design process.	2	2	1	22	51	28	10	5	6	1	123
	X4. This standardized design process serves an important purpose.	2	2	1	18	55	25	13	9	2	1	123
	X5. Things would be better without a standardized design process.	2	2	1	23	44	26	15	7	7	1	123
	X6. A standardized design process is not necessary.	2	3	2	12	45	34	12	14	5	1	123
Continuance Commitment	X7. I have no choice but to go along with a standardized design process.	2	3	3	6	30	28	22	16	15	6	123
	X8. I feel pressure to go along with a standardized design process.	6	4	3	3	14	24	23	16	35	8	123
	X9. I have too much at stake to resist a standardized design process.	4	5	2	0	4	12	34	21	30	22	123
	X10. It would be too costly for me to resist a standardized design process.	4	5	2	1	7	11	36	22	28	18	123
	X11. It would be too risky to speak out against a standardized design process.	6	6	2	0	3	5	21	18	42	34	123
	X12. Resisting a standardized design process is not a viable option for me.	4	4	2	3	11	16	34	23	23	13	123
Normative Commitment	X13. I feel a sense of duty to work toward a standardized design process.	4	4	3	4	27	27	29	21	7	8	123
	X14. I do not think it would be right of me to oppose a standardized design process.	4	4	2	6	23	21	28	28	9	8	123
	X15. I would not feel badly about opposing a standardized design process.	4	4	2	7	12	16	47	18	12	11	123
	X16. It would be irresponsible of me to resist a standardized design process.	4	4	2	7	15	19	32	22	16	12	123
	X17. I would feel guilty about opposing a standardized design process.	4	5	2	4	8	11	29	23	29	19	123
	X18. I do not feel any obligation to support a standardized design process.	4	4	2	7	19	25	27	19	20	6	123

Table 7: Mode, Median, IQR and Frequencies of data for commitment questions

Note: 1=strongly agree, 2= agree, 3=slightly agree, 4=undecided, 5=slightly disagree, 6=disagree, 7=strongly disagree.

Data show that most respondents indicated agreement with the idea staying committed to a new change by their willing. We see that the first 6 questions, addressing the "want" component of commitment, have low median score 1 and IQR=1. That indicates a general agreement to stay committed because they desire to do so. That desire originates from the fact that they find the change necessary, they believe it serves an important purpose, it is not a mistake to introduce it, and things according to their opinions will be better with this standardization.

Questions X7 till X12 are addressing the continuance (need) component of commitment and we see that there is no clear agreement or disagreement. X7 question scores with median 3 but has high IQR of 3 same as X8 with median 4. The rest questions of this group score median 5 or 6 with IQR equal to 2. So we can conclude that in total people do not feel the need to stay committed so strongly due to some associated cost. They believe there is no cost or risk to resist or speak out against respectively. They feel they do not have much at stake to resist. In general, they do not see any loss of benefit or cost from opposing to that change.

The last questions of commitment model, questions X13 till X18, score mainly median 4 and IQR 2. That could indicate people are reluctant to show their obligation or could not understand the questions properly. In this set of questions, words like "guilty", "irresponsible", "feel badly", "obligation", are used and possibly make people reluctant to give the right answers.

Obviously, people seem open to accept a new approach in the working procedure because affective (want) component of commitment scores higher than the remaining two. Unfortunately people do not show clearly their obligation or need for a change. Almost all questions in normative component seem fluctuating around the undecided response option (central tendency bias). Sometimes this tendency is stronger to the agreement left side but sometimes to the disagreement right side. As mentioned, researcher believes this originates from the unclear message for the type of change. Many people during survey session were asking questions about what that change means to them. Based on the commitment data, people are open to change. Therefore the affective component of commitment seems to dominate in this organization.

Addressed Construct	Question	Mode	Median	IQR	Responses for each choice							
					1	2	3	4	5	6	7	Total
Appropriateness	X19. I think that the organization will benefit from a standardized design process.	2	2	2	36	50	24	4	7	1	1	123
	X20. It doesn't make much sense for us to initiate a standardized design process.	6	6	2	1	3	7	9	32	39	32	123
	X21. There are legitimate reasons for us to initiate a standardized design process.	2	2	1	23	51	26	18	3	2	0	123
	X22. A standardized design process will improve our organization's overall efficiency	2	2	1	22	51	28	13	8	0	1	123
	X23. There are a number of rational reasons for a standardized design process to be made.	2	2	2	45	47	18	10	3	0	0	123
	X24. In the long run, I feel it will be worthwhile for me if the organization adopts a standardized design process	2	2	2	22	45	25	21	4	5	1	123
	X25. A standardized design process makes my job easier.	2	3	2	19	40	26	24	6	4	4	123
	X26. When a standardized design process is implemented, I don't believe there is anything for me to gain.	4	5	2	3	9	9	37	23	31	11	123
	X27. The time we are spending on a standardized design process should be spent in something else.	6	5	2	1	4	7	22	36	39	14	123
	X28. A standardized design process matches the priorities of our organization.	2	3	2	16	43	33	23	5	0	3	123
Leadership Support	X29. Our senior leaders have encouraged all of us to embrace a standardized design process.	3	3	2	10	27	31	27	9	12	7	123
	X30. Our organization's top decision makers have put all their support behind a standardized design process effort.	4	4	2	10	23	26	49	7	5	3	123
	X31. Every senior manager has stressed the importance of a standardized design process.	4	4	3	2	11	22	30	15	26	17	123
	X32. This organization's most senior leader is committed to a standardized design process.	4	4	2	5	15	28	37	19	13	6	123
	X33. I think we are spending a lot of time on a standardized design process when the senior managers don't even want it implemented.	4	4	2	1	3	7	52	25	20	15	123
	X34. Management has sent a clear signal this organization is going to a standardized design process.	4	4	3	3	29	18	35	21	12	5	123
Change Self-efficacy	X35. I do not anticipate any problems adjusting to the work I will have when a standardized design process is adopted.	2	2	1	26	44	25	10	12	5	1	123
	X36. There are some tasks that will be required when we adopt a standardized design process that I don't think I can do well.	4	4	2	4	9	18	42	20	22	8	123
	X37. When we implement a standardized design process, I feel I can handle it with ease.	2	3	1	16	45	38	16	6	2	0	123
	X38. I have the skills that are needed to make a standardized design process work.	2	2	1	29	40	25	20	8	1	0	123
	X39. When I set my mind to it, I can learn everything that will be required when a standardized design process is adopted	2	2	2	36	50	19	15	0	3	0	123
	X40. My past experiences make me confident that I will be able to perform successfully after a standardized design process is made.	2	2	1	30	52	17	17	6	1	0	123

Personal Benefit	X41. I am worried I will lose some of my status in the organization when a standardized design process is implemented	7	6	2	3	2	4	13	17	36	48	123
	X42. A standardized design process will disrupt many of the personal relationships I have developed.	7	6	2	2	2	7	19	16	35	42	123
	X43. My future in this job will be limited because of a standardized design process.	7	6	3	0	5	11	22	13	29	43	123
Attitude	X44: Most of my co-workers benefit from a standard design process	2	2	2	21	43	28	25	5	1	0	123
	X45: I usually benefit from standardized processes.	2	3	2	13	34	27	33	8	5	3	123
	X46: Standardized processes usually benefit the organization.	2	2	1	19	51	32	15	2	2	2	123
	X47: I find most standard processes to be pleasing.	2	3	2	3	38	36	19	20	7	0	123
	X48: I intend to do whatever possible to support a standardized design process.	2	3	2	8	49	32	21	4	6	3	123
	X49: Standardized design processes usually helps improve unsatisfactory situations at work.	4	4	3	6	25	25	35	14	10	8	123

Table 8: Model, Median, IQR and Frequencies of data for change valence questions

Note: 1=strongly agree, 2= agree, 3=slightly agree, 4=undecided, 5=slightly disagree, 6=disagree, 7=strongly disagree.

Appropriateness questions, labeled as X19 till X28, show an average IQR equal to 2. Only questions X20, X26 and X27 score negatively with median 6, 5, and 5 respectively. The rest positive scored questions in this group show median scores of 2 and 3. Therefore, appropriateness seems positive for the employees. That means people in this organization acknowledge the need for such a change, they believe that this change will bring some benefit to the organization, and also express their positive opinions regarding the appropriateness of that change. In order words, people believe that standardization is a good option for controlling projects and assign some value for the business success of the organization to that standardization.

Leadership support questions mainly score with median scores of 4 and IQR mainly 2. Leadership support seems to be neutral. That entails for the management team that they do not place enough support behind the standardization effort, also they do not emphasize the need for such standardization, they do not show strong commitment, and finally the message towards standardization is not clear.

Confidence questions score mainly positively with median scores of 2 or 3 and low IQR equal to 1 or 2. Confidence is considered enough to execute the action for change. That means employees feel and believe they can handle easily any request from this change because they have all the required skills to do so. Employees believe that if a standardized process is adopted, then they have all the prerequisite

abilities to learn everything required supporting the new process, and lastly they feel very confident to follow the standardization due to their positive experiences.

Respondents indicated disagreement to questions X41 to X43(beneficial). More precise all three questions score with median 6 and IQR 2 and 3. That means employees do not worry of losing their status due the standardization and they believe their personal relations with other colleagues will not be disrupted. Lastly, they believe their future job will not be limited because of the standardization.

Last questions, X44 till X49, addressing the cognitive component of attitudes, show an average agreement or slight agreement to the relevant questions. Median scores were 2 or 3 and IQR scores were 1 or 2, with the exception of the last question. From this set of questions three main conclusions can be made. Firstly, employees believe that other colleagues will benefit from this change, secondly they find (slightly) that standardization is pleasing and lastly they intend to whatever possible to support this process.

By noticing the bar charts in appendix D, reasonably the conclusion that data show a central tendency bias can be claimed. There are not strong agreements or disagreement, but more slight agreements and disagreements. Also almost all questions have undecided responses.

3.2.3 Descriptive Statistics

In this section, data variables are assumed to be interval data but not ordinal. Statistical mean and standard deviation are computed as well as the correlation matrices are presented. According to theory, standard deviation of a 7-scale Likert data can range between 0 and 3. Mean values, in Table 9, are very close to median values presented earlier. Standard deviations are ranging approximately between 1 and 1.5, considered normal ranging value.

	Descriptive Statistics								
Addressed Construct		Mean	Std. Deviation	N	Addressed Construct		Mean	Std. Deviation	N
Affective Commitment	X1	2,43	1,242	123	Appropriateness	X26	4,67	1,469	123
	X2	2,56	1,268	123		X27	5,12	1,265	123
	X3	2,57	1,331	123		X28	2,76	1,250	123
	X4	2,59	1,247	123	Leadership Support	X29	3,50	1,616	123
	X5	2,71	1,424	123		X30	3,38	1,328	123
	X6	2,92	1,346	123		X31	4,55	1,616	123
Continuance Commitment	X7	3,66	1,614	123		X32	3,92	1,452	123
	X8	4,40	1,608	123		X33	4,76	1,268	123
	X9	5,03	1,390	123		X34	3,80	1,487	123
	X10	4,85	1,449	123	Change Self-efficacy	X35	2,65	1,437	123
	X11	5,57	1,300	123		X36	4,33	1,451	123
	X12	4,50	1,538	123		X37	2,65	1,116	123
Normative Commitment	X13	3,72	1,522	123		X38	2,52	1,244	123
	X14	3,88	1,571	123		X39	2,20	1,138	123
	X15	4,11	1,543	123		X40	2,35	1,180	123
	x16	4,16	1,651	123	Personally Beneficial	X41	5,76	1,439	123
	X17	4,80	1,592	123		X42	5,59	1,454	123
	X18	3,94	1,611	123		X43	5,46	1,532	123
Appropriateness	X19	2,21	1,196	123	Cognitive Component Of Attitudes	X44	2,62	1,156	123
	X20	5,54	1,314	123		X45	3,13	1,408	123
	X21	2,46	1,125	123		X46	2,54	1,196	123
	X22	2,50	1,176	123		X47	3,29	1,285	123
	X23	2,02	1,032	123		X48	2,95	1,342	123
	X24	2,67	1,335	123		X49	3,72	1,555	123
	X25	2,89	1,467	123					

Table 9: Mean and standard deviation of all questions

Table 10 to Table 17 presents correlation matrices of questions X1 to X6 (Affective Commitment), X7 to X12 (Continuance Commitment), X13 to X18 (Normative Commitment), X19 to X28 (Appropriateness), X29 to X34 (Leadership Support), X35 to X40 (Change Self-efficacy), X41 to X43 (Personal Benefit), and X44 to X49(Cognitive Component of attitudes). Due to many questions, all correlations cannot be nicely presented in one table. Therefore only correlations between questions that were expected to show strong correlations are presented in this section. Obviously, there are many correlations between the questions, but this section aims to show the main correlations of questions within the same constructs according to literature. Depicting these correlations is an indication of possible

successfulness of factor analysis following in the next section. In the tables below, letter "r" indicates Pearson's product-moment correlation coefficient, which indicates the strength of the covariance of variables. Symbol "Sig." indicates the statistical significance someone can put on the correlation between variables in order to reject the null hypothesis that the correlation is zero. Significance is defined as 1-(confidence level). Confidence level was set at 95%. The significance level show how much confidence can be put on the correlation result. Correlations with significance close to 0.00 are good predictors of this possible relationship. When significance is high then not a lot of importance must be set on the result. There is high possibility that inference should not be set based on this result. All the significances in the tables which were not equal to 0.00 are marked with red color. The P-value for 2-taile test is 0.9601. Also, it is important that all reversed questions (X3, X5, X6, X15, and X18) have been adapted accordingly before running bivariate correlation analysis.

Affective commitment, appropriateness, and personal benefit correlations have probability value or otherwise statistical significance very low. That means, if the same questions will be used on another population, then the probability of obtaining by chance the indicated correlations is less than 0.05. On the other hand, in the rest measured constructs some high probability values appear. When probability value is high then the correlation value is low. Due to the high probability value, any claim for clear conclusion of relationship is uncertain. Due to the way correlations are presented, the sign of the correlation should have been positive because all the matched questions measure the same construct (unless reversed). It is clear that the correlations in Tables 10 to 17 include mostly positive signs. The three components of commitment, attitudes, and personal benefit has only positive correlation signs. In Tables 13, 14, and 15 all negative correlation sings are blue colored. Also regarding the values of correlations it is clear that the strongest correlations occur in the affective commitment matrix with values reaching 0.8. In all the rest tables, correlation values range approximately within 0.3 and 0.6. In few exceptions, correlation values range within 0.1 and 0.3. High correlations between questions mean that some of them could address the same notions, or just simply when there is change in the value of one question then the other question changes as well.

Affective Commitment - Correlation Matrix							
		X1	X2	X3	X4	X5	X6
X1	r	1					
	Sig.	,000					
X2	r	,787	1				
	Sig.	,000	,000				
X3	r	,748	,746	1			
	Sig.	,000	,000	,000			
X4	r	,807	,715	,753	1		
	Sig.	,000	,000	,000	,000		
X5	r	,609	,663	,659	,611	1	
	Sig.	,000	,000	,000	,000	,000	
X6	r	,492	,497	,474	,522	,641	1
	Sig.	,000	,000	,000	,000	,000	,000

Table 10: Correlation matrix of questions X1 to X6

In Table 10 all affective commitment questions are highly positive correlated. That shows, questions in this concept are possibly addressing the concept properly. People value all questions the same.

Continuance Commitment - Correlation Matrix							
		X7	X8	X9	X10	X11	X12
X7	r	1					
	Sig.	,000					
X8	r	,331	1				
	Sig.	,000	,000				
X9	r	,348	,456	1			
	Sig.	,000	,000	,000			
X10	r	,279	,298	,641	1		
	Sig.	,002	,001	,000	,000		
X11	r	,222	,322	,475	,391	1	
	Sig.	,013	,000	,000	,000	,000	
X12	r	,151	,082	,146	,325	,227	1
	Sig.	,095	,368	,108	,000	,012	,000

Table 11: Correlation matrix of questions X7 to X12

In Table 11, question X12 does not correlate to any other question in the same construct. That means question X12 does not follow any pattern association with other questions in this concept. Possibly, question X12 does not address the same meaning as the co-concept questions do.

Normative Commitment - Correlation Matrix

		X13	X14	X15	X16	X17	X18
X13	r	1					
	Sig.	,000					
X14	r	,486	1				
	Sig.	,000	,000				
X15	r	,404	,665	1			
	Sig.	,000	,000	,000			
X16	r	,223	,554	,646	1		
	Sig.	,013	,000	,000	,000		
X17	r	,197	,413	,580	,689	1	
	Sig.	,029	,000	,000	,000	,000	
X18	r	,411	,545	,563	,382	,392	1
	Sig.	,000	,000	,000	,000	,000	,000

Table 12: Correlation matrix of questions X13 to X18

In Table 12, question X17 and X16 does not correlate to X13. The same conclusion is made as for X12 from Table 11 regarding non correlations In general, medium to high correlation between questions of this construct are observed. Outcomes, from Tables 10, 11 and 12, show that questions follow some sort of pattern association within the same concepts (commitment concepts). This a promising outcome for the statistical analyzes following. Approximately, the same general outcomes are expected in the next tables.

Appropriateness - Correlation Matrix											
		X19	X20	X21	X22	X23	X24	X25	X26	X27	X28
X19	r	1									
	Sig.	,000									
X20	r	-,700	1								
	Sig.	,000	,000								
X21	r	,634	-,707	1							
	Sig.	,000	,000	,000							
X22	r	,677	-,691	,645	1						
	Sig.	,000	,000	,000	,000						
X23	r	,396	-,406	,431	,432	1					
	Sig.	,000	,000	,000	,000	,000					
X24	r	,604	-,597	,506	,691	,367	1				
	Sig.	,000	,000	,000	,000	,000	,000				
X25	r	,514	-,470	,389	,579	,294	,604	1			
	Sig.	,000	,000	,000	,000	,001	,000	,000			
X26	r	-,384	,452	-,364	-,473	-,326	-,504	-,406	1		

	Sig.	,000	,000	,000	,000	,000	,000	,000	,000		
X27	r	-,467	,645	-,506	-,548	-,403	-,510	-,333	,498	1	
	Sig.	,000	,000	,000	,000	,000	,000	,000	,000	,000	
X28	r	,550	-,557	,447	,495	,378	,481	,396	-,286	-,505	1
	Sig.	,000	,000	,000	,000	,000	,000	,000	,001	,000	,000

Table 13: Correlation matrix of questions X19 to X28

Table 13 shows many negative correlations. Negative correlations mean when a variable increases then the other variable decreases. We notice question X20, X26 and X27 have negative correlations with many other questions. Researcher assumes that phrasing of questions is the reason of this outcome. Questions X20, "It does not make much sense for us to initiate a standardized design process", asks an individual to answer a question on behalf of all. In addition, question X26, "When a standardized design process is implemented, I do not believe there is anything for me to gain", obviously is not addressing the discrepancy for a change but something beneficial to an individual. Finally, questions X27, "The time we are spending on a standardized design process should be spent in something else", is a question not clear since the ISO standard is not yet officially introduced. Therefore the outcomes seem logical.

Leadership Support - Correlation Matrix							
		X29	X30	X31	X32	X33	X34
X29	r	1					
	Sig.	,000					
X30	r	,670	1				
	Sig.	,000	,000				
X31	r	,492	,298	1			
	Sig.	,000	,001	,000			
X32	r	,493	,403	,571	1		
	Sig.	,000	,000	,000	,000		
X33	r	-,269	-,126	,036	-,024	1	
	Sig.	,003	,164	,691	,793	,000	
X34	r	,595	,534	,323	,455	-,104	1
	Sig.	,000	,000	,000	,000	,253	,000

Table 14: Correlation matrix of questions X29 to X34

In Table 15 questions X33 does not correlate to any other question in this construct. Questions X33, "I think we are spending a lot of time on a standardized design process when the senior managers do

not even want it implemented", refers to time spent in this effort, but the standard is not yet introduced. That could be reason behind the outcome.

Change Self-efficacy - Correlation Matrix							
		X35	X36	X37	X38	X39	X40
X35	r	1					
	Sig.	,000					
X36	r	-,134	1				
	Sig.	,140	,000				
X37	r	,465	-,304	1			
	Sig.	,000	,001	,000			
X38	r	,392	-,303	,634	1		
	Sig.	,000	,001	,000	,000		
X39	r	,350	-,219	,463	,573	1	
	Sig.	,000	,015	,000	,000	,000	
X40	r	,425	-,234	,523	,696	,783	1
	Sig.	,000	,009	,000	,000	,000	,000

Table 15: Correlation matrix of questions X35 to X40

Again, in Table 15, question X36 does not correlate to any other question. Questions X36, "There are some tasks that will be required when we adopt a standardized design process that I do not think I can do well", possibly misleads participants because they do not understand the full effects of the ISO standard.

Personally Beneficial - Correlation Matrix				
		X41	X42	X43
X41	r	1		
	Sig.	,000		
X42	r	,653	1	
	Sig.	,000	,000	
X43	r	,582	,630	1
	Sig.	,000	,000	,000

Table 16: Correlation matrix of questions X41 to X43

In Table 16 all correlation are high.

Attitude - Correlation Matrix							
		X44	X45	X46	X47	X48	X49
X44	r	1					
	Sig.	,000					
X45	r	,590	1				

	Sig.	,000	,000				
X46	r	,679	,658	1			
	Sig.	,000	,000	,000			
X47	r	,131	,196	,189	1		
	Sig.	,148	,030	,037	,000		
X48	r	,374	,546	,487	,365	1	
	Sig.	,000	,000	,000	,000	,000	
X49	r	,386	,354	,401	,346	,480	1
	Sig.	,000	,000	,000	,000	,000	,000

Table 17: Correlation matrix of questions X44 to X49

In Table 17 question X47 does not correlate to questions X44, X45, X46. Question X47, "I find most standard processes to be pleasing", is completely different from questions X44, X45, and X46. These questions address organizational and individual benefits.

The conclusion of this subchapter is that questions show strong and medium correlations between questions of the same concept. Commitment questions show quite good correlation matrices with high and medium correlations, whereas change valence questions are more problematic regarding correlations. Few questions show no correlation with questions from the same concept. The explanation of those unexpected outcomes originates from the phrasing and structure of the questions. Nevertheless, results are good for extra statistical analysis.

3.3 Commitment Measurement Model

Now it is time to conduct a factor analysis for the commitment measurement model. In this section commitment measurement model from Herscovitch and Meyer (2002) is reflected on the collected data. Initially, section 3.3.1 presents the literature measurement model and section 3.3.2 presents and discusses the process and results of an exploratory factor analysis.

Factor analysis is a method to identify the structure or dimension that underlies the relations among a set of observed variables. With factor analysis researcher aims to prove that the variance of many variables may be explained by a smaller number of underlying clusters. Factor analysis assists in reducing large number of variables and detects structures between variables.

3.3.1 Literature Commitment Measurement Model

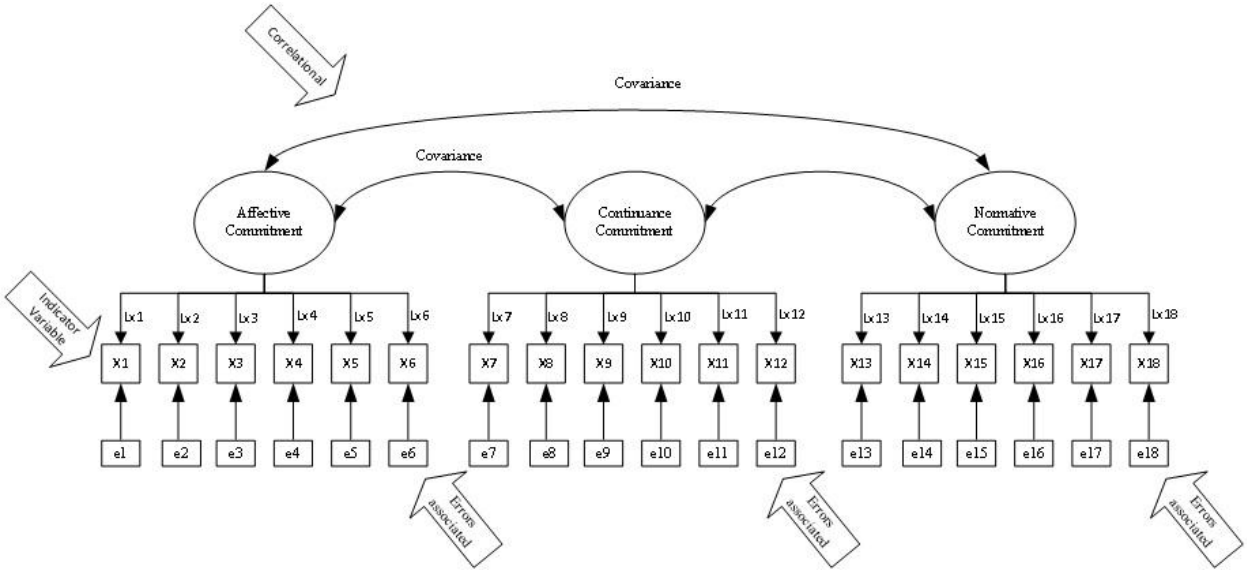


Figure 10: Literature change commitment measurement model (path diagram)

Figure 10 visualizes the commitment model from the literature. As described in chapter 2, commitment model is composed by three components: Affective, Continuance and Normative. These components are correlated to each other (covariance) and measured through 6 questions each. Indexes X1 till X19 are representing the corresponding questions. Indexes e1 till e19 represent the associated errors of regression equation. According to this measurement model all factor loadings are positive except X3, X5, X6, X15, and X18. That means each question is related in a positive or negative way to the associated construct/factor.

3.3.2 Extracting Commitment Measurement Model from Data

In our case, the researcher wants to use factor analysis to find factor loadings of each question to the underlying construct in order to further proceed with statistical analysis. Factor loading are used to calculate the final score of each individual on every construct. Therefore, the researcher uses exploratory analysis although number of constructs is already known from the literature. The main purpose is to reduce 18 commitment variables (questions X1 to X18) to 3 variables (affective, continuance, and normative commitment components) and keep the same meaning and definition of the constructs.

Principal Component Analysis is used in all analyses because the general aim is to summarize the underlying correlational structure of a data set. Rotation of matrices is required due to ambiguity of interpretation. In this section, variables are considered all the questions X1 till X19 and expected extracted factors are the constructs of the three components of commitment. Results of the analysis should show low cross loadings, which means that each measured question/item should load strongly only to one construct (commitment compoenent), and in general the whole extracted model should be similar to the literature model. That simple prerequisite creates an accurate model (unidimensional) addressing the desired construct

Five stages are required to be followed in order factor analysis results being considered robust. These are: (1) Test assumptions, (2) Select type of analysis, (3) Determine number of factors, (4) Select items, (5) Name and define factors.

Stage 1: Testing Assumptions

Here some assumptions are tested. The assumptions are: (1) Garbage-In-Garbage-Out, (2) Sample size, (3) Levels of measurement, (4) Normality, (5) Linearity, (6) Outliers, (7) Factorability.

(1) Garbage-In-Garbage-Out: This assumption is already tested by previous researchers like presented in chapter 2 (section 2.3) when defining theoretical model. All chosen questions go together and high loadings are expected from specific questions to specific constructs. Figure 10 depicts the expected measurement model.

(2) Sample Size: Maccallum, Widaman, Hong (2001) guidelines for data sample size is:

50	Very Poor
100	Poor
200	Fair
300	Good
500	Very Good
1000+	Excellent

Another general guideline about data sample size is dependent on the number of factors. Minimum acceptable size is defined by a ratio of 1:5 which means 1 construct/factor should have at least 5 cases. An ideal size has a ration of 1:20 and an excellent size a ratio of 1:30. In our analysis, we measure a model of

3 factors/constructs. Final sample size reaches 123 replies, therefore a ratio of 1:30 is achieved for a 3-component/factor model

(3) Levels of Measurement: All variables are suitable for correlation analysis since Likert-item data are interpreted as interval data from 1 till 7. The interval 7-level of scale is considered sufficient for statistical analysis (assumption).

(4) Normality: Factor analysis is not very sensitive to normality. Therefore, there is no problem when variables are not normally distributed. Due to nature of Likert-scale responses it is pointless to check normality of data distribution. By noticing bar charts in appendix D, which are presenting the same thing as histograms, we notice that some questions tend to look normally distributed. Obviously, if there is a strong agreement or disagreement with a specific statement and the range of variance is low then histogram is skewed and kurtotic. One way to check if data are normally distributed regarding skewness and kyrtosis is to devide skewness and kyrtosis values with the statistical confidence. If the results are within the limits of -1.96 and +1.96 then each data can be assumed to be normally distributed regarding skewness and kyrtosis. Researcher believes it is pointless to check normality of likert-scale responses.

(5) Linearity: Factor analysis is strongly related to linearity of questions. As mentioned factor analysis looks for combinations based on covariance between questions to search in which way data can be represented best. For this reason, we have to check if there are linear relationships between the questions. Questions are expected to show strong positive relationships. We can claim that due to previous conducted studies with the same questions on different populations. In subsection “descriptive statistics”, we present some info regarding relationships between questions. Generally we can assume that if correlations are above 0.3 then variables are factorable. In our case, we notice some correlations are below 0.3 but mainly most of the questions are correlated stronger than 0.3.

(6) Outliers: Exploration of outliers is not necessary because data are restricted in predefined limits. Range of responses is between 1 and 7.

(7) Factorability: Factorability shows how good data is for factor analysis. One way to measure factorability is to check correlations between questions. If there are not strong correlations (>0.3) then

possibly some variables should not be included in the analysis. Another method is through Bertlett's test of sphericity and/or through Kaiser-Mayer Olkin measure of adequacy. Kaiser-Meyer-Olkin's (KMO) measure of sampling adequacy is considered sufficient option. Values less than 0.7 are not desirable. KMO value is 0.838, higher than 0.7. Also the significance of the test is very good. In appendix D (section 2) extracted table can be found.

We have checked all above assumptions and found that factor analysis can be conducted on the data.

Stage 2: Select Type of Analysis

Selecting type of analysis is already done and explained in the introductory section of factor analysis. Exploratory analysis is chosen and principal component extraction method is used. Factor loadings are used for extra statistical analysis. That entails constructs/factors should correlated and the rotation of matrices is important choice. Oblique rotation creates factors that allow correlations between factors. Correlation between factors/constructs is obligatory fact for further statistical analysis.

Stages 3, 4, 5: Determine Number of Factors, Select Items and Name Factors

According to the chosen theoretical model, three constructs are (three components of commitment) measured by 18 variables. For the sake of readability, Table 18 shows change commitment components.

Construct:	Denotation:
Affective	People who stay committed because they want to do so.
Continuance	People who stay committed because they need to do so.
Normative	People who stay committed because they are obliged to do so.

Table 18: Summary of change commitment constructs as found in literature

Questions can be found in appendix B. Stage 5 is already set because we are just trying to replicate an exploratory analysis in order to use the factor loading results for further analysis, consequently factors are already named and defined.

Extracting Commitment Model from Data

In order to conclude in a measurement model being considered statistically adequate, reliable, convergent and discriminately validated, there have been conducted 5 different factor analyzes.

In first analysis software extracted number of factor components by default. It resulted in 4 components/factors with 65% of total questions' variance expressed by these 4 factors. There were high and low communalities. Questions X6, X7 and X11 had the lowest communalities below than 0.5. More precisely communality values of X6, X7 and X11 were 0.494, 0.362, and 0.464 respectively. Table 19 shows which questions scored highest in each component. Of course cross loadings exist but not presented in this concise table. For the sake of readers understanding, questions scoring in affective, continuance, and normative commitment component, according to literature findings, are colored with green, red and blue respectively. The same coloring is applied in the next 4 following factor analyzes.

Pattern Matrix			
Component			
1	2	3	4
X1	X17	X9	X13
X3	X12	X8	X14
X4	X16	X10	X18
X2	X15	X11	
X5		X7	
X6			

Table 19: Questions with highest loadings from 1st commitment factor analysis

In the second analysis, 3 components have been forced to be extracted by the software. Total variance drop at 60 % and more questions had communalities lower than 0.5. These are X6, X7, X11, X12, X13, X18 with communalities of 0.485, 0.554, 0.467, 0.393, 0.335, and 0.495 respectively. Table 20 shows which questions scored highest in each component. Question X12 should not score high in component 2 according to literature model. Also question X13 is scoring on components 1 and 2 with almost same low loading.

1	2	3
X1	X14	X9
X4	X15	X8
X2	X16	X10
X3	X17	X11
X5	X12	X7
X6	X18	
X13	X13	

Table 20: Questions with highest loadings from 2nd commitment factor analysis

In the next three analyses, questions with low communalities and low factor loadings have been removed progressively and extracted number of forced components has been kept the same. In the third

analysis, item X13 has been removed due to the lowest communality of all. That analysis resulted in total variance of 61 % and the questions still having low communalities were X6, X7, X11, X12, and X18 with communalities values being 0.494, 0.362, 0.464, 0.398, and 0.485 respectively. Table 21 shows questions with the strongest loadings on each component.

1	2	3
X1	X15	X9
X4	X14	X8
X2	X16	X10
X3	X17	X11
X5	X12	X7
X6	X18	

Table 21: Questions with highest loadings from 3rd commitment factor analysis

In fourth analysis, question X7 has been also removed from the analysis. Now the analysis is missing 2 original questions. Total variance resulted in 64% and questions X6, X11, X12, and X18 have the lowest communalities. These values are 0,493, 0.488, 0.394, and 0.487 respectively. Table 22 shows questions with the strongest loadings on each component.

1	2	3
X1	X14	X9
X4	X16	X8
X2	X17	X10
X3	X12	X11
X5	X18	
X6	X15	

Table 22: Questions with highest loadings from 4th commitment factor analysis

In fifth analysis, question X12 has been also removed from the analysis. Now the analysis is missing 3 original questions. Total variance resulted in 66% and questions X6, X11 have the lowest communalities. These values are 0,494 and 0.486 respectively. Table 23 shows questions with the strongest loadings on each component.

1	2	3
X1	X14	X9
X4	X15	X8
X2	X16	X10
X3	X18	X11
X5	X17	
X6		

Table 23: Questions with highest loadings from 5th commitment factor analysis

More detailed results of the final (5^{th}) factor analysis are shown by Table 24, Table 25, and Table 26.

Communalities		
	Initial	Extraction
X1: I believe in the value of a standardized design process	1,000	,808
X2: A standardized design process is a good strategy for this organization	1,000	,769
X3: I think that management is making a mistake by introducing a standardized design process	1,000	,774
X4: This standardized design process serves an important purpose	1,000	,805
X5: Things would be better without a standardized design process	1,000	,691
X6: A standardized design process is not necessary	1,000	,494
X8: I feel pressure to go along with a standardized design process	1,000	,540
X9: I have too much at stake to resist a standardized design process	1,000	,734
X10: It would be too costly for me to resist a standardized design process	1,000	,607
X11: It would be too risky to speak out against a standardized design process	1,000	,486
X14: I do not think it would be right of me to oppose a standardized design process	1,000	,686
X15: I would not feel badly about opposing a standardized design process	1,000	,754
X16: It would be irresponsible of me to resist a standardized design process	1,000	,675
X17: I would feel guilty about opposing a standardized design process	1,000	,591
X18: I do not feel any obligation to support a standardized design process	1,000	,534

Table 24: Communalities of all items from 5th commitment factor analysis

Most questions have sufficient communality which means that all questions are presented to greater or lower extent by the extracted factors. The cumulative percentage of variance is 66 %. That means that the variance of the questions is explained at 66% from these 3 factors. Realistically, 50% total variance explained is considered sufficient percentage.

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5,213	34,754	34,754	5,213	34,754	34,754	4,627
2	3,315	22,098	56,851	3,315	22,098	56,851	4,002
3	1,421	9,476	66,328	1,421	9,476	66,328	2,864
4	,766	5,106	71,434				
5	,711	4,740	76,174				
6	,671	4,474	80,648				
7	,641	4,271	84,919				
8	,479	3,195	88,114				
9	,342	2,282	90,395				
10	,337	2,246	92,641				
11	,287	1,914	94,556				
12	,268	1,789	96,344				
13	,214	1,426	97,770				
14	,194	1,292	99,062				
15	,141	,938	100,000				

Table 25:Eigenvalues and total variance explained from 5th commitment factor analysis

Pattern Matrix[a]			
	Component		
	1 Affective	2 Normative	3 Continuance
Cronbach's alpha	**0.916**	**.855**	**0.746**
X1: I believe in the value of a standardized design process	**,921**	-,091	,010

X4: This standardized design process serves an important purpose	**,905**	-,069	,178
X3: I think that management is making a mistake by introducing a standardized design process	**,881**	-,010	,078
X2: A standardized design process is a good strategy for this organization	**,875**	,004	-,008
X5: Things would be better without a standardized design process	**,765**	,161	-,154
X6: A standardized design process is not necessary	**,636**	,158	-,144
X14: I do not think it would be right of me to oppose a standardized design process	-,045	**,882**	-,130
X15: I would not feel badly about opposing a standardized design process	,003	**,825**	,098
X16: It would be irresponsible of me to resist a standardized design process	-,003	**,812**	,027
X18: I do not feel any obligation to support a standardized design process	,194	**,674**	-,075
X17: I would feel guilty about opposing a standardized design process	,017	**,674**	,186
X9: I have too much at stake to resist a standardized design process	-,002	-,021	**,865**
X8: I feel pressure to go along with a standardized design process	,176	-,172	**,777**
X10: It would be too costly for me to resist a standardized design process	-,073	,220	**,669**
X11: It would be too risky to speak out against a standardized design process	-,164	,129	**,624**
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.			
a. Rotation converged in 5 iterations. **b. Cronbach's alpha α=0.853**			

Table 26: Factor loadings from 5th commitment factor analysis

Reliability of the each set of components and the total reliability are considered good enough due to Cronbach's alpha values higher than 0.7. Convergent validity of the test can be proven after adopting a minimum requirement. In our case researcher accepted an average of 0.7 for each set of items. By summing all accepted high loadings (blue colored) of each components and dividing by the number of questions in each component, the average value is higher than 0.7. Particularly, average components are 0.83, 0.77, and 0.73 for 1, 2 and 3 components respectively. Finally, discriminant validity is ok because in Table 26 all the non-bold green factor loadings are low. That means there are no huge cross loadings. Figure 11 visualizes the final commitment measurement model.

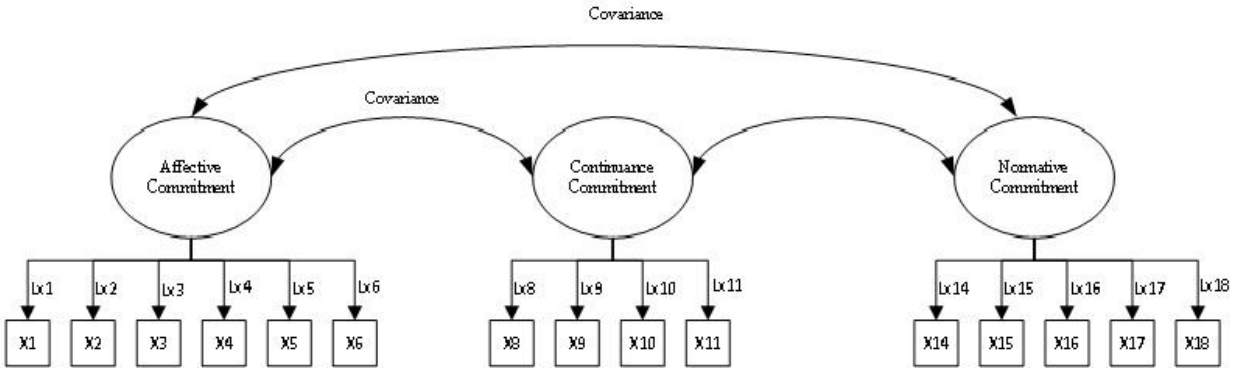


Figure 11: Extracted commitment measurement model

3.4 Change Valence Measurement Model

Section 3.4 reflects and discusses results of a factor analysis on change valence measurement questions. In this section two measurement models, one from Holt et al (2007) and another from Dunham (1989) are reflected on the collected data. Initially, section 3.4.1 presents the literature measurement model and section 3.4.2 presents and discusses the process and results of an exploratory factor analysis.

3.4.1 Literature Change Valence Model

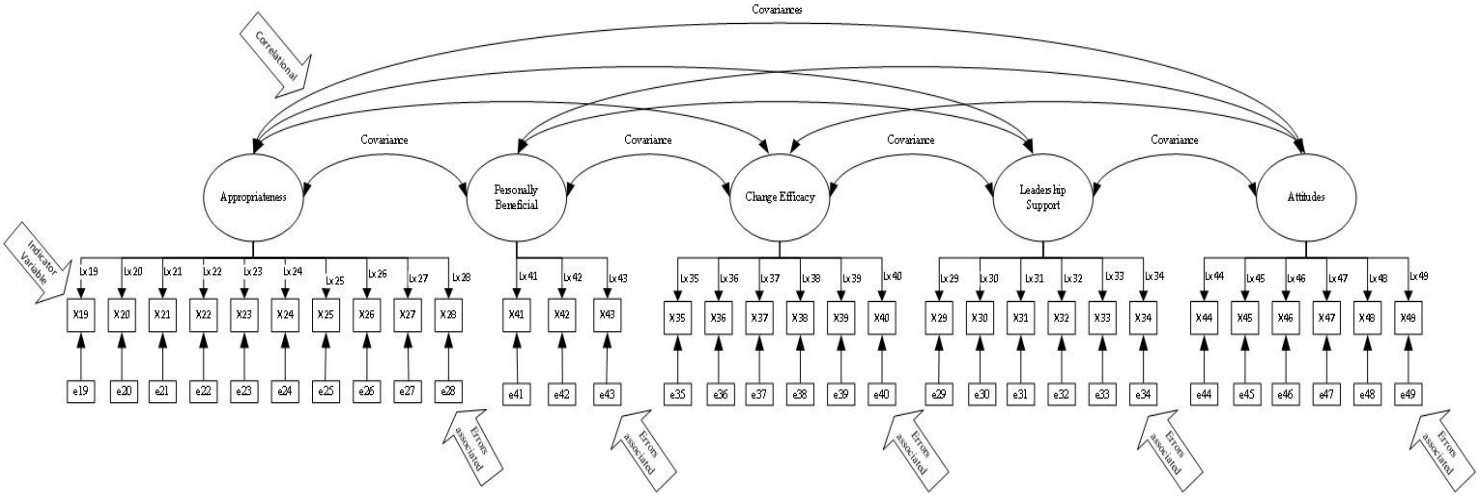


Figure 12: Literature change valence measurement model (path diagram)

Figure 12 above visualizes change valence model. As described in chapter 2, change valence model is composed by five components: (1) appropriateness, (2) leadership support, (3) change self-efficacy, (4) personally beneficial, and (5) attitudes. These constructs are correlated to each other

(covariance) and measured through 31 questions in total. Indexes X19 till X49 are representing the corresponding questions. Indexes e1 till e19 represent the associated errors of regression equation. All relations in this model are positive.

3.4.2 Extracting Change Valence Model from Data

Principal component analysis is used and the aim is to reduce the number of variables (31) to a smaller number of factors 5. ObIimin rotation is used. In this section variables are considered all the questions X19 till X49 and we try to extract the same factors/constructs (appropriateness, leadership support, change self-efficacy, personal benefit, and attitudes) like in literature model.

Results of the analysis should show low cross loadings, which means that each measured variable should load strongly only to one construct, and in general the whole extracted model should be similar to the literature model. That simple prerequisite creates an accurate model (unidimensional) addressing the desired construct

The same 7 stages, like in previous section, must be followed. These are: (1) Test assumptions, (2) Select type of analysis, (3) Determine number of factors, (4) Select items, (5) Name and define factors.

Stage 1: Testing Assumptions

Here some assumptions are tested. The assumptions are: (1) Garbage-In-Garbage-Out, (2) Sample size, (3) Levels of measurement, (4) Normality, (5) Linearity, (6) Outliers, (7) Factorability.

(1) Garbage-In-Garbage-Out: This assumption is already tested by previous researchers like presented in chapter 3 when defining conceptual model. All chosen questions go together and high loadings are expected from specific questions to specific constructs. Figure 10 depicts the expected measurement model.

(2) Sample size: A general guideline about data sample size is dependent on the number of factors. Minimum acceptable size is defined by a ratio of 1:5 which means 1 factor/construct should have at least 5 cases. An ideal size has a ration of 1:20 and an excellent size a ratio of 1:30. In our analysis we measure

a model of 5 factors/constructs. Final sample size in this research reaches 123 replies, therefore a ratio of 1:20 is achieved for a 5-component model.

(3) Levels of Measurement: All questions are suitable for correlation analysis since Likert item data are interpreted as interval data from 1 till 7. The interval 7 level of scale is considered sufficient for statistical analysis (assumption).

(4) Normality: The same reasoning as of commitment model.

(5) Linearity: The same reasoning as of commitment model.

(6) Outliers: The same reasoning as of commitment model.

(7) Factorability: Kaiser-Meyer-Olkin's (KMO) measure of sampling adequacy is considered sufficient option. Values less than 0.7 are not desirable. KMO value is 0.838 higher than 0.7. Also the significance of the test is very good. In appendix D (section 2) extracted table can be found.

Stage 2: Select Type of Analysis

Selecting type of analysis is already done and explained in the introductory section of factor analysis. Exploratory analysis is chosen and principal component extraction method is used. Factor loadings will be used for extra statistical analysis. That entails constructs/factors should correlated and the rotation of matrices is important choice. Oblique rotation creates factors that allow correlations between factors. Correlation between factors is obligatory fact for further statistical analysis.

Stages 3, 4, 5: Determine Number of Factors, Select Items and Name Factors

According to the chosen theoretical model there are five constructs (appropriateness, leadership support, change self-efficacy, personal benefit and attitudes) measured by 31 variables in total. In change valence topic we identified five (5) individual constructs. For the sake of readability, Table 27 presents again these five (5) constructs.

Construct	Denotation
Appropriateness	Individuals might believe that there must or not be a change, so they agree or disagree with a proposed one. The more beneficial the change looks for the organization and the more clearly the need for change is addressed, the more appropriateness is crafted. So their reaction is intentionally decent and can be potentially beneficial for the organization.

Leadership Support	This concept is related to the clear support and commitment of the management team to the proposed change. The more commitment and support is shown from leaders and managers, the more positively affected employees will be. Possibly senior employees have seen change attempts being stall in the past without clear demonstrated support by managers or operators. Consequently they might be skeptical and unwilling to commit themselves to change before any form of support is clearly made.
Change Efficacy	Closely related to motivational theory, it refers to sentiments regarding confidence. People (not organizations) will attempt a change to the extent they feel confident.
Personally Beneficial	Numerous employees will ask "What is in it for me". They will look for the distribution of positive and negative outcomes and how fair change is. If self-interest is threatened then possibly individuals will resist to that change.
Attitudes	In the view of cognitive dimension of an attitude refers to an individual's beliefs about the attitude object. Beliefs express positive and negative evaluation of greater or lesser extremity and occasionally are exactly neutral in their evaluative content".

Table 27: Summary of change valence constructs as extracted from literature.

Questions can be found in appendix B. Stage 5 is already set because we are just trying to replicate an exploratory analysis in order to use the factor loading results for further analysis, consequently factors are already named and defined.

Extracting Change Valence Model from Data

The change valence measurement model has been extracted likewise commitment measurement model. Nine factor analyses have been conducted, each time excluding one or two variables. In the next paragraph only the process and reasoning of each choice will be described. The final measurement model results are presented. Initially, all questions have been put in the analysis and software extracted seven (7) factors. Five questions have communalities lower than 0.5 and some other question load strongly on more than one factor (cross loadings). In the second analysis, five (5) factors have been extracted manually. Three (3) questions have very low communality less than 0.5 or 0.4. In the third analysis, question X47[1] have been deleted but some questions still have low communalities close to 0.4. With the same reasoning, taking into account communalities and minimization of cross loadings, questions X26[2], X31[3], X36[4], X23[5],

[1] I find most standard processes to be pleasing.
[2] When a standardized design process is implemented, I don't believe there is anything for me to gain.
[3] Every senior manager has stressed the importance of a standardized design process.
[4] There are some tasks that will be required when we adopt a standardized design process that I don't think I can do well.
[5] There are a number of rational reasons for a standardized design process to be made.

and X25[6] have been deleted in sequence. At that point, after deleting 6 questions, the total variance drops suddenly. Researcher decided to force four (4) extracted factors instead of 5. That choice has been made in order to see if there will be important changes in loadings. From the really beginning attitude items were randomly set in many factors, except 3 attitude questions that constantly score on component 1. Eventually, question X25 has been removed and the result looks very similar to the literature model without the attitudes construct. Three of the attitudes questions have been set in the appropriateness factor while two (2) more have been set in confidence construct. That result is reasonable due to the way questions are structured. Particularly questions X44[7], X45[8], and X46[9] have been set in appropriateness factor. Also questions X48[10] and X49[11] are set in confidence factor. All the rest questions are set in factor components as originally found in literature. In appropriateness and personal benefit factor/construct, some negative loadings are found. That means these questions address the opposite meaning of the underlying construct. Appropriateness construct has only two (2) questions with negative loadings whereas all chosen questions of personal benefit construct load negatively. By altering the positive meaning of the construct to a negative meaning then negative loadings can be replaced with positive loadings. In that sense personal benefit is annotated as personal obstruction addressing the idea of disrupting relations within the organizations and creating more unfair situations regarding positive or negative consequences of the change. This meaning is used in the following analysis.

Detailed results of the final factor analysis are shown by Table 28, Table 29, and Table 30. Same as in commitment extracted model, communalities are quite good and the total variance explained is 63%.

Communalities		
	Initial	Extraction
X19: I think that the organization will benefit from a standardized design process	1,000	,678

[6] A standardized design process makes my job easier.
[7] Most of my co-workers benefit from a standard design process
[8] I usually benefit from standardized processes.
[9] Standardized processes usually benefit the organization.
[10] I intend to do whatever possible to support a standardized design process.
[11] Standardized design processes usually helps improve unsatisfactory situations at work

X20: It doesn't make much sense for us to initiate a standardized design process	1,000	,740
X21: There are legitimate reasons for us to initiate a standardized design process	1,000	,651
X22: A standardized design process will improve our organization's overall efficiency	1,000	,706
X24: In the long run, I feel it will be worthwhile for me if the organization adopts a standardized design process	1,000	,629
X27: The time we are spending on a standardized design process should be spent in something else	1,000	,585
X28: A standardized design process matches the priorities of our organization	1,000	,514
X29: Our senior leaders have encouraged all of us to embrace a standardized design process	1,000	,769
X30: Our organization's top decision makers have put all their support behind a standardized design process effort	1,000	,670
X32: This organization's most senior leader is committed to a standardized design process	1,000	,530
X34: Management has sent a clear signal this organization is going to a standardized design process	1,000	,618
X35: I do not anticipate any problems adjusting to the work I will have when a standardized design process is adopted	1,000	,521
X37: When we implement a standardized design process, I feel I can handle it with ease	1,000	,664
X38: I have the skills that are needed to make a standardized design process work	1,000	,642
X39: When I set my mind to it, I can learn everything that will be required when a standardized design process is adopted	1,000	,638
X40: My past experiences make me confident that I will be able to perform successfully after a standardized design process is made	1,000	,765
X41: I am worried I will lose some of my status in the organization when a standardized design process is implemented	1,000	,747
X42: A standardized design process will disrupt many of the personal relationships I have developed	1,000	,618
X43: My future in this job will be limited because of a standardized design process	1,000	,610
X44: Most of my co-workers benefit from a standard design process	1,000	,521
X45: I usually benefit from standardized processes	1,000	,631
X46: Standardized processes usually benefit the organization	1,000	,673
X48: I intend to do whatever possible to support a standardized design process	1,000	,630
X49: Standardized design processes usually helps improve unsatisfactory situations at work	1,000	,443
Extraction Method: Principal Component Analysis.		

Table 28: Communalities of all items from 9th factor analysis

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	8,972	37,382	37,382	8,972	37,382	37,382	7,750
2	2,579	10,747	48,130	2,579	10,747	48,130	5,866
3	1,997	8,323	56,453	1,997	8,323	56,453	4,591
4	1,645	6,856	63,308	1,645	6,856	63,308	3,628
5	1,114	4,640	67,948				
6	,866	3,610	71,558				
7	,760	3,169	74,727				
8	,653	2,723	77,449				
9	,625	2,604	80,053				
10	,619	2,579	82,632				
11	,511	2,131	84,763				
12	,474	1,975	86,738				
13	,424	1,766	88,504				
14	,389	1,622	90,126				
15	,347	1,447	91,572				

16	,334	1,392	92,964				
17	,305	1,273	94,237				
18	,259	1,080	95,317				
19	,254	1,058	96,375				
20	,230	,957	97,331				
21	,217	,904	98,236				
22	,186	,775	99,011				
23	,133	,553	99,564				
24	,105	,436	100,000				

Table 29:Eigenvalues and total variance explained from 9th factor analysis

Pattern Matrix[a]				
	Component			
	1 Appropriateness	2 Change Self-efficacy	3 Personally Beneficial	4 Leadership Support
Cronbach's alpha	**0.646**	**0.830**	**0.831**	**0.815**
X19: I think that the organization will benefit from a standardized design process	**,694**	,131	,007	,134
X20: It doesn't make much sense for us to initiate a standardized design process	**-,808**	,130	-,207	-,046
X21: There are legitimate reasons for us to initiate a standardized design process	**,627**	-,096	,335	,111
X22: A standardized design process will improve our organization's overall efficiency	**,821**	,065	-,001	-,053
X24: In the long run, I feel it will be worthwhile for me if the organization adopts a standardized design process	**,779**	,060	-,048	-,001
X27: The time we are spending on a standardized design process should be spent in something else	**-,832**	,312	-,110	,010
X28: A standardized design process matches the priorities of our organization	**,735**	-,051	-,038	,057
X29: Our senior leaders have encouraged all of us to embrace a standardized design process	,095	-,121	-,011	**,877**
X30: Our organization's top decision makers have put all their support behind a standardized design process effort	,086	-,043	,021	**,797**
X32: This organization's most senior leader is committed to a standardized design process	-,040	-,014	-,154	**,746**
X34: Management has sent a clear signal this organization is going to a standardized design process	-,014	,053	-,151	**,786**
X35: I do not anticipate any problems adjusting to the work I will have when a standardized design process is adopted	-,174	**,811**	-,030	-,049
X37: When we implement a standardized design process, I feel I can handle it with ease	,273	**,624**	,064	-,030
X38: I have the skills that are needed to make a standardized design process work	-,036	**,558**	,340	,171
X39: When I set my mind to it, I can learn everything that will be required when a standardized design process is adopted	-,162	**,516**	,494	,109
X40: My past experiences make me confident that I will be able to perform successfully after a standardized design process is made	-,223	**,657**	,487	,063
X41: I am worried I will lose some of my status in the organization when a standardized design process is implemented	-,084	,211	**-,901**	,098
X42: A standardized design process will disrupt many of the personal relationships I have developed	-,269	,025	**-,677**	,157
X43: My future in this job will be limited because of a standardized design process	-,046	-,081	**-,738**	,093

X44: Most of my co-workers benefit from a standard design process	**,604**	,211	-,005	-,022
X45: I usually benefit from standardized processes	**,532**	,392	-,049	,036
X46: Standardized processes usually benefit the organization	**,712**	,218	-,001	-,071
X48: I intend to do whatever possible to support a standardized design process	,241	**,739**	-,174	-,130
X49: Standardized design processes usually helps improve unsatisfactory situations at work	,346	**,526**	-,362	-,068
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.				
a. Rotation converged in 8 iterations. **b. Cronbach's alpha= 0.765**				

Table 30: Factor loadings from 9th factor analysis

In the above Table 31, all undesired medium cross loadings are colored with red.

Reliability of each set of components and the total reliability are considered good enough due to Cronbach's alpha values higher than 0.7. Although Cronbach's alpha for appropriateness (0.646) is a bit lower that 0.7, the researcher accepts this value because the component loadings are high and there are no high cross loading from other item components. Convergent validity of the test can be proven after adopting a minimum requirement. In our case researcher accepted an average of 0.7 for each set of items. By summing all factor for each components and dividing by the number of items in each component the average core is higher than 0.7. Particularly average components are 0.71, 0.63, 0.77, and 0.80 for 1, 2, 3, and 4 components respectively. Finally discriminant validity is ok because most non-bold factor loadings are low. That means there are no huge cross loadings. Figure 13 visualizes the final change valence measurement model composed by four (4) factors instead of five (5).

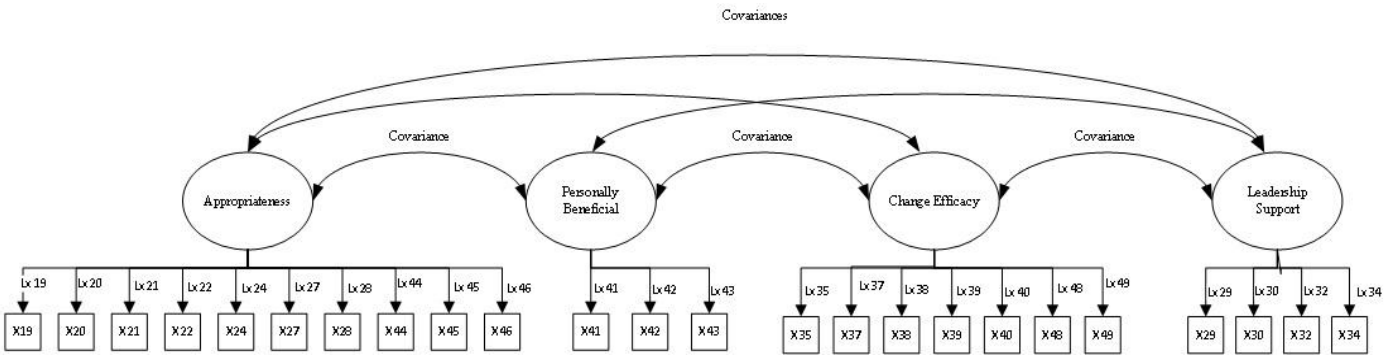


Figure 13: Extracted change valence measurement model

3.5 Factor Scores for Regression Analysis

Distefano, Zhu, Mindrila (2009) summarize the 6 techniques used to calculate factor scores for using in subsequent analyses. They categorize the techniques into 2 groups. The first group known as non-refined methods is less sophisticated and complicated than the second group, called refined methods.

Non-refined Methods	Refined Methods
Sum Scores- Above a cut-off value	Regression Scores
Sum Score – Standardized Variables	Bartlett Scores
Weighted Sum Scores	Anderson-Rubin Scores

In this research, we use the weighted sum score because we want to calculate individual scores by including only the questions we desire (blue colors from Table 26 and Table 30). The procedure followed to calculate individual scores on each construct is summarized in the Table 31. This table visualizes an example of one factor/construct. Brackets in the table contain a number. For each factor, this process has to be followed. The process is programmed in the used statistical software. At this point it is very important to mention a limitation of this approach. With this method, the researcher does not use the right component weightings but very good approximation of them. Actually, the researcher should conduct extra factor analysis on each set of chosen questions/items for each construct. But, due to high correlations between these questions/items in each set, the component weightings will not differ significantly. Therefore, the researcher uses this method which yields results very close to the right results.

The results of these calculations will be used in the sequent subchapter “Regression Analysis”.

Factor Scores of factor component i						
		Factor loadings of m variables scoring high in the factor component 1				
		FX1	FX2		FXm	
Row 0	Individuals	[Value of FX1]	[Value of FX2]	…	[Value of FXm]	Final Individual Score on component i
Row 1	1	[Score of individual 1 on variable X1]*[FX1]	[Score of individual 1 on variable X2]*[FX2]	…	[Score of individual 1 on variable Xm]*[FXm]	[Sum of the row 1]/[Sum of row 0]
Row 2	2	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
Row N	N	[Score of individual N on variable X1]*[FX1]	[Score of individual N on variable X2]*[FX2]	…	[Score of individual N on variable	[Sum of the row N] / [Sum of row 0]

					Xm]*[FXm]	

Table 31: Calculating individual's scores on extracted factor components

In other words, we calculate all individual scores of every construct (three commitment components, appropriateness, leadership support, change efficacy, and personal obstruction). All scores are in Table 56 in Appendix D (section 3). On these score, some parametric statistical values are calculated. Table 32 shows the median and standard deviation of the scores. Comparing the results of the qualitative analysis with these results, we notice that the results do not differ significantly. More specific, affective commitment quantitative score is mainly 2 and affective commitment factor score is 2.35, continuance commitment quantitative score is 5 and continuance commitment factor score is 4.86, normative commitment quantitative score is 4 and normative commitment factor score is 4.15, appropriateness quantitative score is 2 and appropriateness factor score is 2.52, leadership support quantitative score is 4 and factor score is 3.51, change efficacy quantitative score is 3 and factor score is 2.56, finally personal benefit quantitative score is 6 and factor is 6. It is important to remind that in the factor analysis personal benefit factor has been renamed to personal obstruction. This change has been done only for the purposes of the following regression analysis, so the results of equations could be reasonable for interpretation. Generally, the scores from factor analysis are quite close to scores from quantitative analysis. That means that the theoretical model (quantitative analysis) shows credibility regarding reuse.

Statistics								
		ACS	CCS	NCS	APPR	SUP	EFF	BEN
N	Valid	123	123	123	123	123	123	123
Median		2,3586	4,8672	4,1530	2,5282	3,5162	2,5657	6,0052
Std. Deviation		1,10539	1,09990	1,27369	,96409	1,19248	,92263	1,27722

Table 32: Median and standard deviation of factor scores

Note: 1=strongly agree, 2= agree, 3=slightly agree, 4=undecided, 5=slightly disagree, 6=disagree, 7=strongly disagree

3.6 Regression Analysis

3.6.1 Research Model

Figure 14 and Table 33 present the research model. Independent variables are change valence factors while dependent variables are commitment components, both studied in the previous chapters. The choice of regression analysis was made based on a decision-making tree diagram to apply non-parametric and parametric statistics. The tree can be found in appendix E.

Regression Designation	Dependent Variables	Independent Variables
ACS	Affective Commitment Scale	APPR, SUP, EFF, OBS,
CCS	Continuance Commitment Scale	APPR, SUP, EFF, OBS,
NCS	Normative Commitment Scale	APPR, SUP, EFF, OBS,
Where APPR= Appropriateness, SUP=Leadership Support, EFF=Change Efficacy, OBS=Personal Obstruction.		

Table 33: Research model for regression analysis

As described in the literature, the independent variables used in this analysis affect the organizational change readiness. Weiner (2009) suggests that these variables affect change commitment and by definition affect organizational change readiness too. Therefore this section tests the potential relationship between change valence constructs and change commitment components.

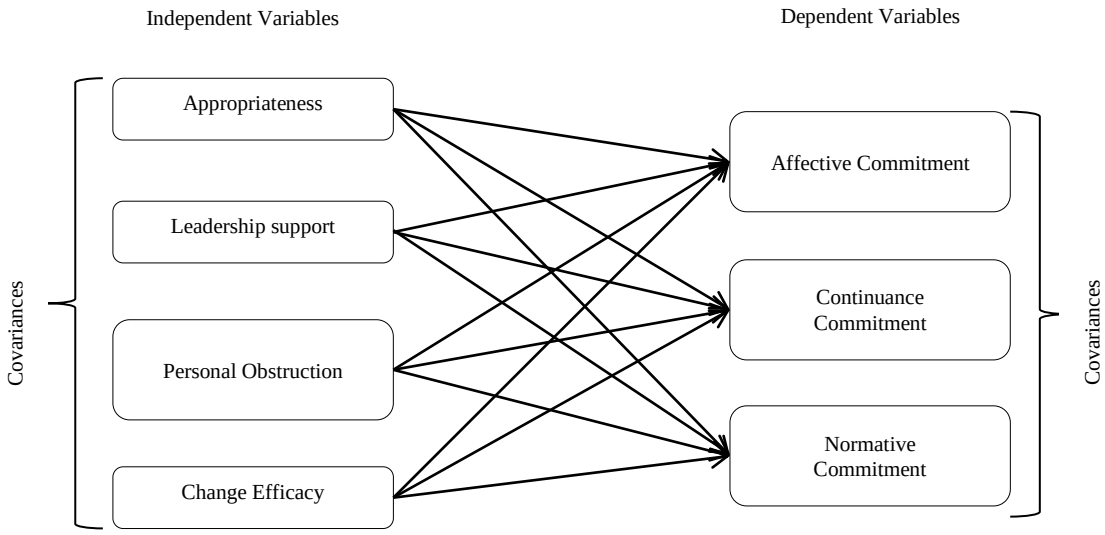


Figure 14: Statistical research model

3.6.2 Application

Table 34 summarizes correlations and associated significances between all studied variables. Only four (4) correlations have high significance (low statistical confidence) and are marked with red color (SUP - OBD, APPR - CCS, SUP - CCS, ACS - CCS). All correlations between change valence variables are positive and only leadership support and personal obstruction variable does not correlate to each other. Additionally, commitment components correlations are all positive. Between affective commitment and continuance commitment component, correlation is not present. Between the two concepts (commitment and valence) only two correlations do not exist. Appropriateness and leadership support constructs do not correlate to affective commitment and continuance commitment components. Also, change efficacy or confidence construct is negatively correlated to continuance commitment component as well as personal obstruction variable to continuance commitment and normative commitment. Figure 15 visualizes these correlations.

Correlations								
		ACS	CCS	NCS	APPR	SUP	EFF	BEN
ACS	r	1						

	Sig.							
CCS	r	,002	1					
	Sig.	,493						
NCS	r	,328**	,408**	1				
	Sig.	,000	,000					
APPR	r	,738**	-,073	,311**	1			
	Sig.	,000	,211	,000				
SUP	r	,246**	,117	,310**	,303**	1		
	Sig.	,003	,098	,000	,000			
EFF	r	,409**	-,232**	,231**	,587**	,223**	1	
	Sig.	,000	,005	,005	,000	,007		
OBS	r	,209*	-,371**	-,219**	,432**	-,001	,406**	1
	Sig.	,010	,000	,008	,000	,497	,000	
**. Correlation is significant at the 0.01 level.								
*. Correlation is significant at the 0.05 level.								

Table 34: Correlation matrix of all final variables

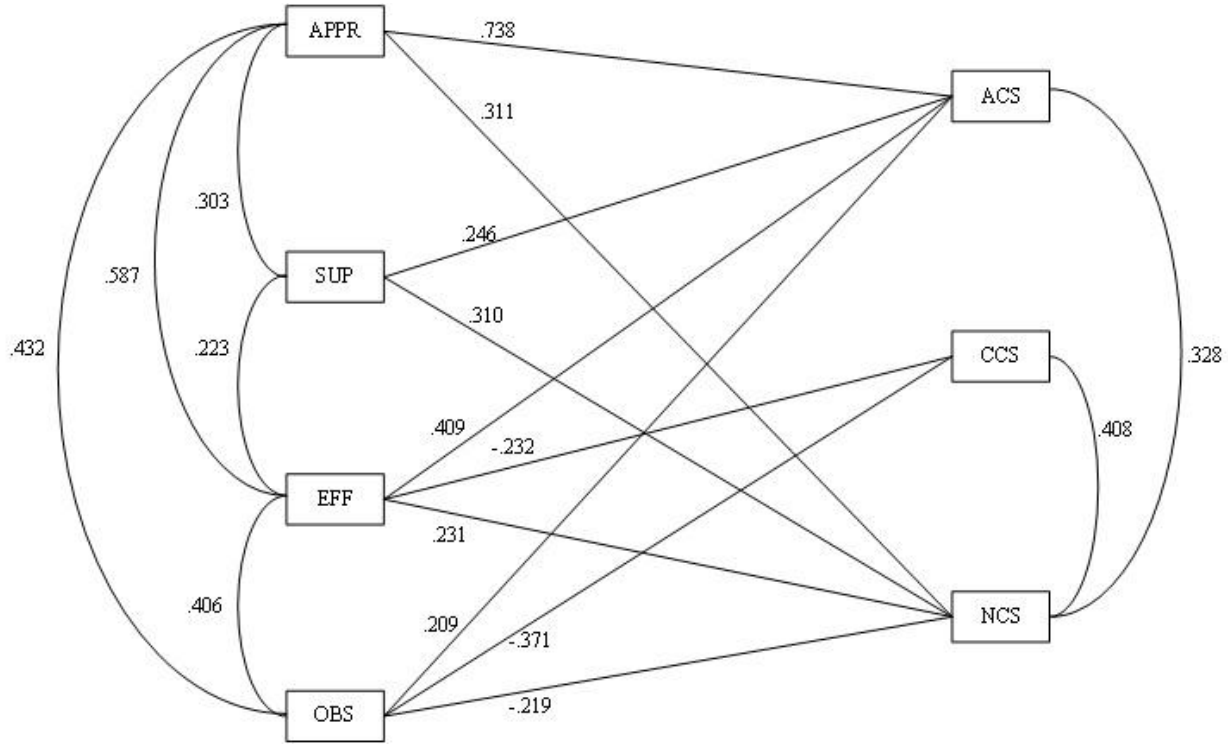


Figure 15: Visualized correlations

Multiple linear regressions based on Stepwise method were calculated to predict affective, continuance and normative commitment based on change valence constructs. Significant regression equations were found:

ACS(APPR)=0.371 + 0.842*[APPR],

CCS(OBS)= 5.709 - 0.319*[OBS],

NCS(APPR, SUP, OBS)= 2.938 + 0.569*[APPR] - 0.403*[OBS] + 0.192*[SUP]

Tables 34 to 36 summarize regression analysis results. Multicollinearity diagnosis has been conducted and variance inflation factor (VIF) shows values ranging between 1 and 2. The critical value of VIF, above which collinearity problems are considered strong, is 10. Therefore collinearity problems do not appear in this model. Initially, a preliminary analysis was conducted with the Enter method. The scatter plot of residuals with the predicted value (affective commitment) showed a data with high residual value. For that reason, that data has been removed from the population (the data which had very high affective commitment value). Scatter plot of residuals, after removing the outlier, shows no significant outliers in the model.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,371	,179		2,070	,041
	APPR	,842	,065	,763	12,886	,000
a. Dependent Variable: ACS, R=0.763, F=166,061, Sig=0.000						

Table 35: ACS regression analysis

Excluded Variables[a]						
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	SUP	,029[b]	,471	,639	,043	,947
	EFF	-,020[b]	-,269	,788	-,025	,632
	OBS	-,157[b]	-2,327	,022	-,209	,747
a. Dependent Variable: ACS						
b. Predictors in the Model: (Constant), APPR						

Table 36: Excluded variables from ACS regression analysis

Coefficients[a]				
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.

		B	Std. Error	Beta		
1	(Constant)	5,709	,197		28,947	,000
	OBS	-,319	,073	-,371	-4,390	,000
a. Dependent Variable: CCS, : ACS, R=0,371, F=19,274, Sig=0.000						

Table 37: CCS regression analysis

Excluded Variables[a]						
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	APPR	,107[b]	1,142	,256	,104	,814
	SUP	,117[b]	1,394	,166	,126	1,000
	EFF	-,097[b]	-1,054	,294	-,096	,835
a. Dependent Variable: CCS						
b. Predictors in the Model: (Constant), BEN						

Table 38: Excluded variables from CCS regression analysis

Coefficients[a]						
Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	3,085	,318		9,705	,000
	APPR	,410	,114	,311	3,594	,000
2	(Constant)	3,475	,301		11,527	,000
	APPR	,657	,116	,498	5,675	,000
	OBS	-,432	,087	-,433	-4,943	,000
3	(Constant)	2,938	,387		7,596	,000
	APPR[b]	,569	,121	,431	4,698	,000
	OBS[c]	-,403	,087	-,404	-4,629	,000
	SUP[d]	,192	,088	,179	2,415	,015
a. Dependent Variable: NCS, : ACS, b. R=0,311, F=12,916, Sig=0.000 c. R=0,499, F=19,928, Sig=0.000 d. R=0.527, F=15,252, Sig=0.000						

Table 39: NCS regression analysis

Excluded Variables[a]						
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	SUP	,238[b]	2,690	,008	,238	,908
	EFF	,074[b]	,694	,489	,063	,656
	OBS	-,433[b]	-4,943	,000	-,411	,814
2	SUP	,179[c]	2,415	,015	,195	,887

	EFF	,183[c]	1,855	,066	,168	,627
3	EFF	,165[d]	1,682	,095	,153	,621
a. Dependent Variable: NCS						
b. Predictors in the Model: (Constant), APPR						
c. Predictors in the Model: (Constant), APPR, OBS						
d. Predictors in the Model: (Constant), APPR, OBS, SUP						

Table 40: Excluded variables from NCS regression analysis

Null hypothesis in regression analysis is usually set as the regression coefficient being equal to zero. In the above tables, t values are summarized for each independent variable. In the third column of the Table 41 results of rejected and non-rejected hypotheses are summarized. Regression coefficients with non-equal symbols entail rejected hypotheses. Rejected hypothesis does not entail that independent variables are surely influencing dependent variable, but they might influence. In other words, rejected hypotheses show which independent variables could influence the dependent.

Three graphs of standardized residuals with the dependent variables are in appendix D (section 4), as well as three normal P-P plot of regression standardized residuals. P-P plots show a curvature, meaning that residuals are not approximately normally distributed and not independent. Also, on scatter plot almost all values have the same variability all the way along horizontal axis, but there are some variability values much higher than the normal. That could entail not homoscedastic model. Estimations of the model assumptions are done only intuitively based on the researcher's judgement.

Regression	Null Hypothesis	Result
ACS	$b^1_{0(appr)} = 0, b^1_{0(sup)} = 0, b^1_{0(eff)} = 0,$ $b^1_{0(obs)} = 0,$	$b^1_{0(appr)} \neq 0, b^1_{0(sup)} = 0, b^1_{0(eff)} = 0,$ $b^1_{0(obs)} = 0,$
CCS	$b^2_{0(appr)} = 0, b^2_{0(sup)} = 0, b^2_{0(eff)} = 0,$ $b^2_{0(obs)} = 0,$	$b^2_{0(appr)} = 0, b^2_{0(sup)} = 0, b^2_{0(eff)} = 0,$ $b^2_{0(obs)} \neq 0,$
NCS	$b^3_{0(appr)} = 0, b^3_{0(sup)} = 0, b^3_{0(eff)} = 0,$ $b^3_{0(obs)} = 0,$	$b^3_{0(appr)} \neq 0, b^3_{0(sup)} \neq 0, b^3_{0(eff)} = 0,$ $b^3_{0(obs)} \neq 0,$
$b^i_{j(index\ name)}$ where index is (i) indicates the regression analysis number, index (j) indicates the type of hypothesis. When j=0 and j=1 then coefficient estimators are representing null hypothesis and alternative hypothesis respectively. Finally, index (index name) shows the investigated variable from the list of change readiness factors.		

Table 41: Hull hypotheses and associated results

In conclusion, appropriateness variable seems to be the only construct predicting affective commitment. This can mean that when need and discrepancy for a change are appropriately addressed in the organization or proved that a change is necessary, then people could stay committed to the change because they want to do so. That desire for commitment shows possible concern for the organizational success. Continuance commitment appears to be negatively influenced by personal obstruction construct. That means the less beneficial a change is to individuals, individuals' commitment due to need seems to decrease. In other words, if a change disrupts relations between employees, then people will not stay committed because there is a cost for them caused by this change. Although, it does not mean that something has be altered within the change itself to maintain good relations, because people could find other ways to maintain good relations. Finally, obligation for commitment appears to be positively predicted by appropriateness and leadership support whereas negatively predicted by personal obstruction. That entails leadership communication, leader's commitment and support to a change, creates obligation in individuals' feelings to stay committed, as well as better communication of the discrepancy between the actual situation and the desired, obligates higher commitment. That created obligation due to appropriateness could underlie fear. From discussions, some employees confessed that they will do whatever is requested by the top managers if their employment status is under risk. Therefore fear could be one reason creating that obliged commitment due to leadership communication/support. On the other hand obligation for commitment appears to decrease if the change unsettles relations between employees. That means if employees will feel that their personal relations are disrupted, then their obligation to commit will decrease as a consequence.

Conclusions

From factor analysis, we have found that commitment model shows similar structure with the literature commitment model (only three questions, X7, X12, and X13 have been removed from commitment model). The commitment factor analysis concludes in a simple and reliable model. On the other hand, the two change valence models do not show the same expected results like the models from

the literature. Instead of concluding to a five-component model, we concluded in a four-component model (seven questions have been removed from the original models, X23, X25, X26, X31, X33, X36, and X47). Eventually cross loadings were minimized and the model is simple and reliable (only appropriateness construct shows cronbach's alpha lower than 0.7).

Commitment statements (readiness statements) seem to provide a clear message. Affective commitment statements score positively (agreement) with median 2 (agree). People seems to commit because they want to do so. Continuance commitment statements score mainly negatively (disagreement) with median 5 (slightly disagree). That means people do not commit due to an associated cost or need. Lastly, normative commitment statements score with media 4 (undecided), which means people do not show their obligation or non-obligation.

In the change valence construct, all statements score mainly positively (agreement) with the exception of leadership support which scores neutral. More specific, appropriateness seems to score highest, mainly with median 2, than the rest two variables, change efficacy and personal obstruction, which score with median 3 (slightly agree) and median 2 (agree). Table 42 summarizes that information.

Construct	Quantitative Score	Factor score	Annotation	Contribution to ORC
Affective Commitment	2	2.35	Agree	Positive
Continuance Commitment	5	4.86	Slightly Disagree	Negative
Normative Commitment	4	4.15	Neutral	Neutral
Appropriateness	2	2.52	Agree	Positive
Leadership Support	4	3.51	Neutral/Undecided	Neutral
Change Efficacy	3	2.56	Slightly Agree	Positive
Personal Obstruction	6	6.00	Disagree	Positive

Table 42: Summarized scores on each construct

Regression analysis reveals that affective commitment can be positively influenced by appropriateness variable, while continuance commitment can be negatively influenced by personal obstruction variable, and finally normative commitment seems to be influenced by three variables.

Appropriateness and leadership support influence positively normative commitment while personal obstruction negatively.

Chapter 4: Conclusions

4.1 Introduction

In this last chapter, research approach, implication of methodologies and limitations are summarized. Also, research findings are quickly reviewed and some recommendations are given regarding the reuse of this research and potential link with other researches. Finally, the researcher gives hypothetical recommendations to the engineering organization.

Research approach includes literature study and statistical analyses. Theory of organizational change readiness has been studied. Statistical analyses are used to test a theory on the topic. From the literature study, two theoretical and measurement models of change commitment and valence have been found and used. Online Likert-scale questionnaire has been used to the collect data. Factor analyses are conducted to find what the scores of individuals on each measured construct (commitment components and change valence constructs) are and finally regression analysis is conducted to examine the associations between the two different concepts. In summary, we have found that a 5-component change valence model becomes a 4-component model. From these 4 components, personal benefit component has been renamed as personal obstruction and given an opposite meaning. Findings from commitment factor analysis slightly differ from literature findings (only three questions from literature model are excluded from the extracted model). Commitment component scores and change valence scores do not differ significantly from the scores extracted with the pre-statistical analysis (quantitative analysis of the theoretical measurement model without any prior factor analysis). That shows validity of the theoretical models. Regression analysis shows that affective commitment is predicted only by appropriateness. Continuance commitment is negatively predicted by personal obstruction. Normative commitment is positively predicted by appropriateness and leadership support while negatively predicted by personal obstruction.

4.2 Conclusions

The organization is facing the challenge to integrate ISO15288 in its operations. Therefore the main problem is to give conclusions to the engineering company regarding the readiness for change. As stated in the literature chapter, this problem is complex and multi-facet. We have collected data regarding the psychological state of being ready to accept or reject, and after analyzing and presenting the findings, we conclude to the following for each research question:

- Research question 1 and sub-questions 1.1 and 1.2:

  1) To which extent the organization is ready to implement a new change in the design process based on ISO15288?

     1.1) What is the score of the change valence factors in the organization?

     1.2) What components of commitment do score positively or negatively in the organization?

- Answers and conclusions of research question 1, 1.1, and 1.2:

1.1) Appropriateness, or the discrepancy for change, appears to be quite positive scoring with median 2 (agree). That score indicates that people acknowledge the need for a change regarding the process of working. They believe that this change will bring some benefit to the organization (question X19[12]), it make sense for them to initiate that change (questions X20[13]), also express their positive opinions regarding the appropriateness of that change, like that standardization matches some priorities of the organization (questions X28[14]) and will improve the overall efficiency of the organization (question X22[15]). In order words, people believe that standardization is a good option for controlling projects and assign some value to that standardization for the business success of the company. Unfortunately, for leaders in the company at this point in time, employees believe leaders do not communicate and support enough that potential changing process. Leadership support questions mainly score with median 4

[12] I think that the organization will benefit from a standardized design process.
[13] It doesn't make much sense for us to initiate a standardized design process.
[14] A standardized design process matches the priorities of our organization.
[15] A standardized design process will improve our organization's overall efficiency.

(undecided). That entails for the management team that they do not place enough support behind the standardization effort (question X30[16]), they do not show strong commitment (question X32[17]), and finally the message towards standardization is not clear (question X34[18]). That fact that leadership score is neutral could mean that people are reluctant to show their real opinion, or because there is no clear opinion regarding leadership support. Regarding change efficacy, employees feel confident in initiating and implementing this change because change efficacy questions score mainly positively with media 3 (slightly agree). Confidence is considered enough to execute the action for change. That means employees feel and believe they can handle easily any request from this change (question X37[19]) because they have all the required skills to do so (question X38[20]). Employees believe that if a standardized process is adopted, then they have all the prerequisite abilities to learn everything required to support the new process (question X39[21]), and lastly they feel very confident to follow the standardization due to their positive experiences (question X40[22]).

Additionally, fears of disrupting personal relations do not appear in the company due to that potential change. More precise, all three personal obstruction questions scored with median 6 indicating disagreement. That means employees do not worry of losing their status due the standardization (question X41[23]) and they believe their personal relations with other colleagues will not be disrupted (question

[16] Our organization's top decision makers have put all their support behind a standardized design process effort.
[17] This organization's most senior leaders are committed to a standardized design process.
[18] Management has sent a clear signal this organization is going to a standardized design process.
[19] When we implement a standardized design process, I feel I can handle it with ease.
[20] I have the skills that are needed to make a standardized design process work.
[21] When I set my mind to it, I can learn everything that will be required when a standardized design process is adopted.
[22] My past experiences make me confident that I will be able to perform successfully after a standardized design process is made.
[23] I am worried I will lose some of my status in the organization when a standardized design process is implemented.

X42[24]). Lastly, they believe their future job will not be limited because of the standardization (question X43[25]).

1.2) The researcher concludes that affective commitment dominates with quite strong agreement in desiring new more standardized design process. That means people are willing to commit. . That desire originates from the fact that they find the change necessary (question X6[26]), they believe it serves an important purpose (question X4[27]), it is not a mistake to introduce it (question X3[28]), and lastly things will be better with this standardization according to their opinions (question X5[29]). Continuance commitment statements score mainly negatively (slightly disagree). So we conclude that in total people do not feel the need to stay committed so strongly due to some associated cost. They believe there is no cost or risk to resist or speak out against respectively (questions X10[30] and X11[31]). They feel, they do not have much at stake to resist (question X9[32]). In general, they do not see any loss of benefit or cost from opposing to that change. Lastly normative commitment appears to be neutral (4, undecided). That could indicate people are reluctant to show their obligation or could not understand the questions properly. In this set of questions, words like "guilty", "irresponsible", "feel badly", "obligation", are used and possibly make people reluctant to give the right answers.

In conclusion, employees consider themselves ready to accept ISO 15288 and quite willing to do so. That willingness creates a friendly context for the change. Desired commitment is positively active showing encouraging results for being ready to change for implementing ISO15288. Need for commitment is not present. Unfortunately, leaders haven't created friendly change context but people feel confident and open to implement the change. Table 43 summarizes the positive or negative value of each

[24] A standardized design process will disrupt many of the personal relationships I have developed.
[25] My future in this job will be limited because of a standardized design process.
[26] A standardized design process is not necessary.
[27] This standardized design process serves an important purpose.
[28] I think that management is making a mistake by introducing a standardized design process.
[29] Things would be better without a standardized design process.
[30] : It would be too costly for me to resist a standardized design process.
[31] It would be too risky to speak out against a standardized design process.
[32] I have too much at stake to resist a standardized design process.

construct to the organizational change readiness. It is very important to mention that even one component of commitment could be enough to create readiness and support organizational changes. The difference between the levels of readiness, each commitment component brings, is the psychological reason why people stay committed and obviously the respective behaviors of this pressure. The fact that continuance commitment is negative and normative commitment is neutral, that does not entail low organizational readiness. Affective commitment value can be an adequate amount to initiate a change. That result depicts also a healthy organization in respect to how much people feel any form of pressure (continuance and normative commitment). We see people do not feel any need or obligation for commitment but mostly desire the commitment.

Construct	Contribution to ORC
Affective Commitment	Positive
Continuance Commitment	Negative
Normative Commitment	Neutral
Appropriateness	Positive
Leadership Support	Neutral
Change Efficacy	Positive
Personal Obstruction	Positive

Table 43: Constribution of constructs to ORC

- Research question 2 and sub-questions 2.1 and 2.2:

  2) How could the organization influence the organizational change readiness through change valence constructs?

  2.1) How strong correlations are observed among all change valence factors and commitment components?

  2.2) What are the change valence factors that can influence commitment components?

- Answers and conclusions of research question 2, 2.1, 2.2:

2.1) In Figure 15 appropriateness is very strongly correlated to affective commitment. Strong correlations within change valence variables appear between appropriateness and personal benefit,

personal benefit and change efficacy, change efficacy and appropriateness. Also strong correlation between commitment components appear between continuance and normative commitment. Finally, strong correlation between change valence and commitment components appear between personal benefit and continuance commitment, change efficacy and affective commitment. All the rest correlations are either weak or do not exist. Correlations which do not exist are between leadership support and personal benefit, appropriateness and continuance commitment, leadership support and continuance commitment, and finally between affective and continuance commitment. Non-existing correlations means these constructs do not have any potential predictive value in regression model.

2.2) According to the regression analysis results, affective commitment is changing positively (increases) when appropriateness increases. Appropriateness is the only change valence variable influencing the value of affective commitment. That entails clear change message and the need for that change can affect the commitment of people originating from their desire. The better the appropriateness and necessity of a change are described and proved, the more committed people feel.

Continuance commitment is negatively influenced by personal obstruction. That means, the more status, personal relations and future job are altered in a negative way for employees in the organization then people feel less committed.

Lastly, normative commitment is influenced by appropriateness, leadership support and personal obstruction. Personal obstruction influences negatively, while appropriateness and leadership support influence positively. Either positively or negatively, the strongest impact is brought by appropriateness, then in decreasing scale, personal obstruction follows and finally leadership support. That means if change managers desire to alter the value of normative commitment with the highest impact and possible less effort, they should focus more on appropriateness and personal obstruction. The more leaders support this change, encourage people for such a change, sent a clear sign that this change is coming, and finally the more leaders show their commitment to that change, the more obligation for commitment will flourish from employees. The same obligation can increase due to better communication of the change

appropriateness. Lastly, due to personal obstruction, if future job, or personal status, or personal relations are negatively affected by the change then less obligation for commitment will appear.

With research question 2, we found how change valence constructs influence organizational change readiness through commitment components. In conclusion, if managers increase the appropriateness construct then people will feel more affective and normative committed. Also their better leadership support and communication can increase the normative commitment. Finally, if personal obstruction construct is minimized then continuance and normative commitment could have higher values.

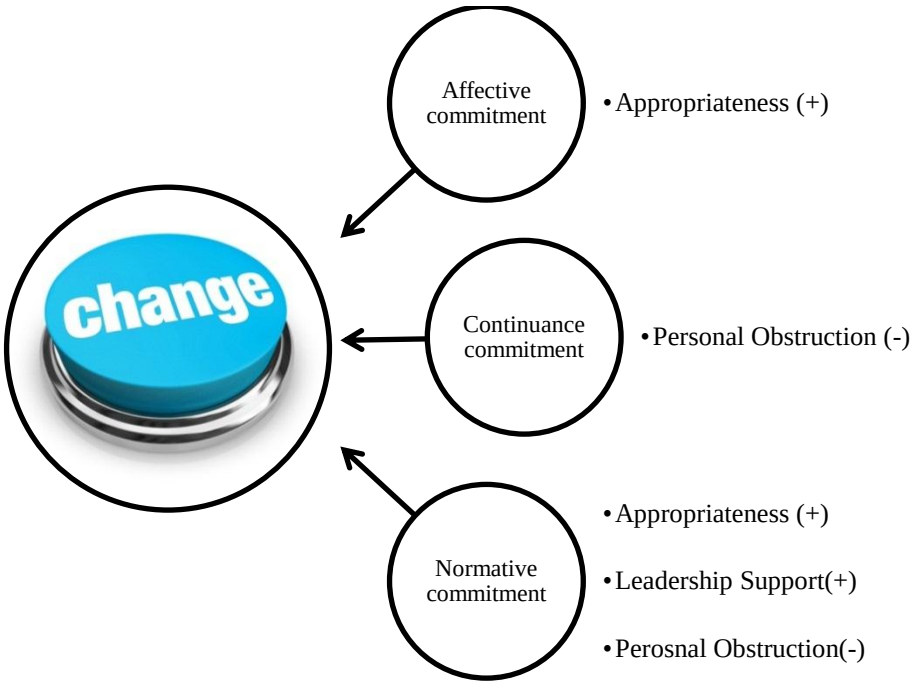


Figure 16: Organizational change readiness through change valence constructs

4.3 Hypothetical Recommendations

As mentioned in the introduction, the company will possibly face the challenge to overcome negative reactions on the proposed ISO change. One way to moderate possible negative reactions, is through controlling sentiments associated to this change. These sentiments can and should be shaped via better communication of the change message in the organization (increase appropriateness). The communication message can be useful approach in any stage of the change process. It can be used before introducing, during implementation and after being rejected or accepted by employees. In order to increase commitment, and by definition organizational change readiness as well, the values of change

valence constructs should be altered. According to the regression analysis results, if appropriateness, leadership support, and personal obstruction values change, then commitment components change too.

Appropriateness could be increased, if individuals, who are not part of the decision making process, are informed about details of the process followed before making the final choice (Holt et al, 2007). An example of how the new process will assist in excelling results will be very important. Generally a nice proved analysis of benefits could be extremely useful in communicating the message for change. Also, by depicting the current situation and a beneficial situation in the future after adopting standardization, could increase discrepancy awareness and eventually the appropriateness construct too. In that way, people become more informed about the benefits of standardization and more open to receive extra information about the proposed change.

One dangerous point in initiating such a change might hide in the past negative experience. If the organization initiated change efforts that have been abandoned, then skepticism might exist throughout the organization. Leaders should address their commitment and support more strongly, by emphasizing that resources and time required will be provided to support the transformational process in any case (Holt et al, 2007). The necessary aspects, like resources or time, that leaders should emphasize their support and commitment upon, are closely related to the contents of the change. That means, these aspects are discoverable either by studying and comparing the current and the future situation (potential future research) or by carefully monitoring the implementation of the change.

Personal benefit or obstruction can be addressed by promising fair distribution of responsibilities over the new working process, by keeping away negative effects of the change on the status of people and their job roles. Also, if opportunities due to the change for advancement and development are addressed and emphasized, then personal obstruction might decreases. In that way, cost-committed employees will feel more committed.

4.4 Limitations

It is very tempting to note some important limitations. Even if the sample size meets minimum sampling requirements, extra tests on larger sample could validate results, like larger population, or other organizations, and/or other fields. Another limitation which researcher believes is really important, is the fact that a 7 point Likert-scale has been interpreted as a continuous scale from 1 to 7. Possibly the undecided choice does not imply continuity from agreement to disagreement.

Regarding the whole research approach, it is necessary to mention that this approach is the first attempt to assess the relationships between the studied concepts. The researcher uses exploratory factor analysis and regression analysis as main techniques for his study.

Although, these techniques are considered sufficient methods for scientific validation, the exploratory factor analysis is used mainly when the constructs are not pre-identified. In this research, confirmatory factor analysis should have been executed to test data on the theoretical models because the concepts and definitions from the literature were kept the same. The researcher prepared readers for a confirmatory analysis because he presented correlations between questions of the same constructs, and not a mix of correlations, showing that data are following a predefined structure. Eventually pure exploratory (7steps of factor analysis) analysis is conducted. Additionally, instead of principal component analysis method, principal axis factoring should have been used. Mainly, principal axis factoring is used with exploratory factor analysis. Nevertheless, after consultation with statistical experts, the difference in the factor loadings between principal component and principal axis factoring methods will not be significant and the limitation can be ignored. Also, the limitation of using the wrong analysis (exploratory instead of confirmatory) is not significant and the results are considered reliable. What we have learned from this mistake, is that when using existing literature models then confirmatory factor should be used while exploratory analysis should be used when new concepts and constructs are studied.

Regression analysis is the second step, after correlation analysis, in the assessment of relations between constructs or concepts. As mentioned, in chapter 2, this theory has never been tested on a

specific population and data shows that the theoretical models are successfully reproduced. This preliminary study shows evidence of potentials in formulating a structured model for research and application purposes. Nevertheless, this approach has limitations. A more sophisticated method could be applied, like the structural equation modeling to develop a model for the aforementioned purposes. With structural equation modeling, a model between change valence and commitment can be set and assessed. In other words, regression analysis in this research assesses the relationships between the constructs separately (three different regression analyses) but structural equation modeling can find and assess causal relations between constructs and also do an analysis of variance of multiple dependent variables at the same time. That means two or more regression analyses can be executed at the same time to assess the relationships between constructs by including in the analysis the effect of all constructs at once. To describe the limitation more simply, we have neglected the correlations between the commitment components (normative with continuance and affective commitment). By reflecting the results of regression analysis on this limitation, we notice that normative commitment component is influenced by three variables, two of which (personal obstruction and appropriateness) influence the affective and continuance commitment as well. That means structural equation modeling will describe and predict more systematically the effect of personal obstruction and appropriateness on affective and normative components.

4.5 Future Research

In the case someone would like to develop a model, would be very interesting to include moderators, like age or gender, and mediators, like years of experience or roles or education. Mediators could be used to explain why change valence constructs are influencing commitment while moderators could classify, if applicable, the strength of that connection. An example could be that the more working experience (mediator) someone has, the less obligation for commitment he feels.

Organizational change readiness is an important assessment in the process of planning and executing changes in organizations but unfortunately a consistent connection between the change

management techniques and organizational assessment tools does not exist. This research attempts to test an adapted model indicating that some readiness factors can shape a message for commitment and change. This preliminary study can be used in establishing some theory between the steps of readiness assessment and change management techniques. The company can use this assessment while adopting and implementing the ISO 15288 standard. The use of this assessment tool should be carefully controlled and monitored during the change faces in order to make potential links with change management theory. Additionally, change efficacy concept (not change efficacy construct) must be studied to depict the whole change readiness concept. A study in this topic will better reflect the whole readiness assessment theory. The company could initiate research in collaboration with universities at several educational levels to narrow the gap between organizational change readiness theory and practical change techniques. Change management is mainly focusing in the process of assisting individuals to successfully make the required transition. In that sense change managers are using strategies to help, convince and transform the past to the future. This transition or institutionalization can potentially become more effective, reliable and consistent if empirical data/information as such could be connected to the change management theory. That connection could increase successfulness and minimize efforts towards the transformation goal.

From literature point of view, empirical data from this research show associations between commitment and readiness factors. As found in literature, there are numerous other organizational factors influencing organizational commitment, but these studies address only the commitment to maintain employment membership. This research tests the readiness towards concrete changes associated to systems engineering norms and ISO standards. Organizations interested in adopting more concrete steps for controlling projects could be interested in the results. Since standardization is an issue challenging many international organizations they all tend to operate in similar ways. A more extensive empirical study in engineering companies towards a similar change might reflect more significant results with respect to empirical validity. A more broad study will ground the validity of the study. A first attempt could be in other offices of the company around the world or maybe research only in Dutch engineering organizations. Researcher speculates that different organizational cultures will reflect different results.

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Appendices

Appendix A: ISO15288

This appendix visualizes the ISO 15288 Systems and Software engineering. Figure 17 show the whole systems engineering process summarized in 9 steps. First three steps (D1 till D3) define problem, analyze stakeholders, and capture requirements regarding the system. Step U1 till U3 generate the design. U1 step is functional analysis of the requirements to find out in next step U2 which are the basic design principles. In U3 step based on the design principles, the designer makes an array of design options. In the last three steps (E1 till E3) these options are evaluated according to a trade-off matrix.



Figure 17: Systems engineering design process

Appendix B: Questionnaires from Literature & Final Survey

Survey questions in English

Below the reader can find the questions as found in literature by Herscovitch Meyer (2002), Holt et al (2007) and Dunham (1989). The series of statements represent feelings that individuals might have about the company or organization for which they work. Respondents have been asked to provide their own feelings about the particular organization for which you are now working. Table 44 till Table 46 are measuring commitment components. Table 47, Table 48, Table 49, Table 50, and Table 51 are measuring appropriateness, leadership support, change efficacy, personally beneficial and attitudes respectively.

Affective Commitment Scale (ACS variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X1. I believe in the value of a standardized design process.							
X2. A standardized design process is a good strategy for this organization.							
X3. I think that management is making a mistake by introducing a standardized design process. ®							
X4. This standardized design process serves an important purpose.							
X5. Things would be better without a standardized design process. ®							
X6. A standardized design process is not necessary. ®							

Table 44: Questions X1 till X6 measuring affective commitment (Herscovitch and Meyer, 2002)

Continuance Commitment Scale (CCS variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X7. I have no choice but to go along with a standardized design process.							
X8. I feel pressure to go along with a standardized design process.							
X9. I have too much at stake to resist a standardized design process.							
X10. It would be too costly for me to resist a standardized design process.							
X11. It would be too risky to speak out against a standardized design process.							
X12. Resisting a standardized design process is not a viable option for me.							

Table 45: Questions X7 till X12 measuring continuance commitment (Herscovitch and Meyer, 2002)

Normative Commitment Scale (NCS variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X13. I feel a sense of duty to work toward a standardized design process.							
X14. I do not think it would be right of me to oppose a standardized design process.							
X15. I would not feel badly about opposing a standardized design process. ®							
X16. It would be irresponsible of me to resist a standardized design process.							
X17. I would feel guilty about opposing a standardized design process.							
X18. I do not feel any obligation to support a standardized design process. ®							

Table 46: Questions X13 till X18 measuring normative commitment (Herscovitch and Meyer, 2002)

Appropriateness (APPR variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X19. I think that the organization will benefit from a standardized design process.							
X20. It doesn't make much sense for us to initiate a standardized design process.							
X21. There are legitimate reasons for us to initiate a standardized design process.							
X22. A standardized design process will improve our organization's overall efficiency							
X23. There are a number of rational reasons for a standardized design process to be made.							
X24. In the long run, I feel it will be worthwhile for me if the organization adopts a standardized design process							
X25. A standardized design process makes my job easier.							
X26. When a standardized design process is implemented, I don't believe there is anything for me to gain.							
X27. The time we are spending on a standardized design process should be spent in something else.							
X28. A standardized design process matches the priorities of our organization.							

Table 47: Questions X19 till X28 measuring appropriateness (Holt et al, 2007)

Leadership Support (SUP variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X29. Our senior leaders have encouraged all of us to embrace a standardized design process.							
X30. Our organization's top decision makers have put all their support behind a standardized design process effort.							
X31. Every senior manager has stressed the importance of a standardized design process.							
X32. This organization's most senior leader is committed to a standardized design process.							
X33. I think we are spending a lot of time on a standardized design process when the senior managers don't even want it implemented.							
X34. Management has sent a clear signal this organization is going to a standardized design process.							

Table 48: Questions X29 till X34 measuring leadership support (Holt et al, 2007)

Change Efficacy (EFF variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X35. I do not anticipate any problems adjusting to the work I will have when a standardized design process is adopted.							
X36. There are some tasks that will be required when we adopt a standardized design process that I don't think I can do well.							
X37. When we implement a standardized design process, I feel I can handle it with ease.							
X38. I have the skills that are needed to make a standardized design process work.							
X39. When I set my mind to it, I can learn everything that will be required when a standardized design process is adopted							
X40. My past experiences make me confident that I will be able to perform successfully after a standardized design process is made.							

Table 49: Questions X35 till X40 measuring change efficacy (Holt et al, 2007)

Personally Beneficial (BEN variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X41. I am worried I will lose some of my status in the organization when a standardized design process is implemented							
X42. A standardized design process will disrupt many of the personal relationships I have developed.							
X43. My future in this job will be limited because of a standardized design process.							

Table 50: Questions X41 till X43 measuring personally beneficial (Holt et al, 2007)

Cognitive Dimension of Attitudes (ATT variable)	Strongly Disagree	Disagree	Slightly Disagree	Undecided	Slightly Agree	Agree	Strongly Agree
X44: Most of my co-workers benefit from a standard design process							
X45: I usually benefit from standardized processes.							
X46: Standardized processes usually benefit the organization.							
X47: I find most standard processes to be pleasing.							
X48: I intend to do whatever possible to support a standardized design process.							
X49: Standardized design processes usually helps improve unsatisfactory situations at work.							

Table 51: Questions X44 till X49 measuring cognitive component of attitudes (Dunham, 1989)

Survey Format and Questions in Dutch

Below the format of the survey is presented and all the questions are in Dutch. Some extra background information was gathered regarding gender, level of experience in years, group, and role position in the organization/department.

Assessing Change Valence & Change Commitment
Laat ons weten hoe belangrijk een gestandaardiseerd ontwerpproces voor jou is. Jouw feedback helpt ons om een prettige werkomgeving te creëren.

Deel 1 | Over jou.
Hier volgen vier vragen over je geslacht, functie, hoeveel jaar ervaring je hebt en tot welke groep je behoord. Deze informatie is van belang voor het onderzoek maar je hebt de keuze om deze sectie open te laten. Indien je deze vragen niet wilt beantwoorden click dan vier keer op de rechter pijl om verder te gaan naar sectie 2
Wat is je geslacht: 1) Man, 2) Vrouw
Wat is je functie binnen organisatie: 1) Trainee, 2) Ontwerper, 3) Senior ontwerper, 4) Specialist, 5) Senior specialist, 6) Adviseur, 7) Senior adviseur, 8) Assistant projectleider, 9) Projectleider, 10) Projectmanager, 11) Toezichthouders, 12) Hoofd Advieusgroep, 13) Afdelingsdirecteur
Hoe lang ben je werkzaam bij organisatie?: 1) 2 jaar of minder, 2) 3 tot 5 jaar, 3) 6 tot 10 jaar, 4) 11 tot 15 jaar, 5) 16 of meer jaar
Voor welke afdeling binnen rail ben je werkzaam: 1) Studies & Advies, 2) Ruimtelijk Ontwerp, 3) Studies en Beveiliging, 4) Bouw en Assetmanagement

Inleiding tot de enquête
Hieronder volgt een reeks stellingen over organisatie met betrekking tot het gestandaardiseerd ontwerpproces die je gevoelens en overtuigingen weergeven. Graag voor elke stelling de mate aangeven of je het er mee eens of oneens bent. Graag de vragen zo eerlijk mogelijk beantwoorden.

De volgende 3 stellingen geven aan hoe groot je betrokkenheid is met betrekking tot een gestandaardiseerd ontwerpproces.
Stelling 2 | *Affective Commitment Scale*
X1: Ik geloof in de waarde van een gestandaardiseerd ontwerpproces.
X2: Een gestandaardiseerd ontwerpproces is een goede strategie voor deze organisatie
X3: Ik denk dat het management een fout maakt door een gestandaardiseerde ontwerpproces te introduceren.
X4: Een gestandaardiseerd ontwerpproces ondersteunt een belangrijk doel
X5: De werkzaamheden zouden beter gaan zonder een gestandaardiseerd ontwerpproces.
X6: Een gestandaardiseerd ontwerpproces is niet noodzakelijk.
Stelling 3 | *Continuance Commitment Scale*
X7: Ik heb geen andere keus dan mee te gaan, in het werken, conform een gestandaardiseerde ontwerpproces.
X8: Ik voel druk om mee te gaan, in het werken, met een gestandaardiseerde ontwerpproces
X9: Ik heb teveel op het spel staan om tegen het werken volgens een gestandaardiseerde ontwerpproces in te gaan

X10: Het is mij te kostbaar om tegen een gestandaardiseerde ontwerpproces in te gaan
X11: Ik vind het te riskant om mijzelf uit te spreken tegen een gestandaardiseerde ontwerpproces.
X12: Mij tegen het gestandaardiseerd ontwerpproces verzetten is geen haalbare optie.
Stelling 4 | *Normative Commitment Scale*
X13: Ik voel mij verplicht om volgens een gestandaardiseerd ontwerpproces te werken
X14: Ik denk niet dat het goed zal zijn om mij tegen een gestandaardiseerd ontwerpproces te verzetten.
X15: Ik voel me goed om mij tegen een gestandaardiseerd ontwerpproces te verzetten.
X16: Het zou onverantwoord zijn om mij tegen een gestandaardiseerd ontwerpproces te verzetten.
X17: Ik zou mij schuldig voelen als ik mij tegen een gestandaardiseerd ontwerpproces verzet.
X18: Ik voel geen verplichting om een gestandaardiseerd ontwerpproces te ondersteunen.

De volgende stelling gaat over jou mening die je hebt over de wenselijkheid en waardigheid voor die specifieke verandering voor de organisatie.
Stelling 5 | *Appropriateness*
X19: Ik denk dat de organisatie voordelen haalt uit een gestandaardiseerd ontwerpproces.
X20: Het heeft voor ons niet veel zin om een gestandaardiseerd ontwerpproces te starten.
X21: Er zijn voor ons legitieme redenen om een gestandaardiseerd ontwerp proces te starten
X22: Een gestandaardiseerd ontwerp proces zal de algehele efficiëntie van onze organisatie helpen te verbeteren.
X23: Er dient aan een aantal voorwaarden voldaan te worden om een gestandaardiseerd ontwerp proces te kunnen maken.
X24: Het zal voor mij op de lange termijn waardevol zijn als de organisatie met een gestandaardiseerd ontwerp proces gaat werken.
X25: Een gestandaardiseerd ontwerp proces maakt mijn werkzaamheden makkelijker.
X26: Als er een gestandaardiseerd ontwerp proces is geïmplementeerd denk ik niet dat er voor mij wat te winnen valt.
X27: De tijd die we besteden aan een gestandaardiseerd ontwerp proces kan beter aan iets anders besteed worden.
X28: Een gestandaardiseerd ontwerp proces past bij de prioriteiten van onze organisatie.

De volgende stelling gaat over jou mening hoe helder de leidinggevende zich zelf inzetten voor en het ondersteunen van een gestandaardiseerd ontwerp proces.
Stelling 6 | *Leadership Support*
X29: Onze lijnmanagers hebben ons aangemoedigd om een gestandaardiseerd ontwerp proces te omarmen.
X30: De marktgroep directeur steunt de inspanningen voor een gestandaardiseerd ontwerp proces.
X31: Elke projectleider/projectmanager heeft mij gewezen op het belang van een gestandaardiseerd ontwerp proces.
X32: De meeste projectleiders/projectmanagers uit onze organisatie zetten zich in voor een gestandaardiseerd ontwerp proces.
X33: Ik denk dat wij veel tijd spenderen aan het standaardiseren van een ontwerp proces omdat de lijnmanagers deze niet willen implementeren
X34: Het management heeft een duidelijke signaal afgegeven dat de organisatie de ontwerpprocessen gaat standaardiseren

De volgende stelling gaat over het vertrouwen dat jij hebt om een gestandaardiseerd ontwerp proces te ondersteunen en hierin te handelen

Stelling 7 | *Change Efficacy*
X35: Ik heb geen problemen om mij aan te passen op het moment dat er een gestandaardiseerd ontwerp proces wordt ingevoerd.
X36: Er zijn sommige taken die uitgevoerd moeten worden op het moment dat er een gestandaardiseerd ontwerp proces wordt ingevoerd waarvan ik denk dat ik deze niet goed kan uitvoeren.
X37: Als er een gestandaardiseerd ontwerp proces wordt ingevoerd heb ik het idee dat ik hier makkelijk in mee kan.
X38: Ik heb de capaciteiten die nodig zijn om een gestandaardiseerd ontwerp proces succesvol te laten zijn
X39: Op het moment dat ik mij hiervoor inzet kan ik alles leren dat nodig is om mij het gestandaardiseerd ontwerp proces eigen te maken.
X40: Mijn ervaring geeft mij vertrouwen dat ik in staat ben om succesvol te zijn nadat er een gestandaardiseerd ontwerp proces in ingevoerd.

De volgende stelling beantwoordt de vraag “what is in it for me?”
Stelling 8 | *Personal Beneficial*
X41: Ik ben bezorgd omdat ik mijn status in de organisatie verlies op het moment dat er een gestandaardiseerd ontwerp proces is ingevoerd.
X42: Een gestandaardiseerd ontwerp proces zal veel van mijn persoonlijke relaties die ik heb opgebouwd verstoren.
X43: Mijn toekomst in deze functie zal beperkt worden op het moment dat er een gestandaardiseerd ontwerp proces is ingevoerd.

De volgende stelling gaat over jou houding ten opzichte van een gestandaardiseerd ontwerp proces.
Stelling 9 | *Attitude (Cognitive Dimension)*
X44: De meeste van mijn collega’s hebben voordelen bij een gestandaardiseerd ontwerp proces.
X45: Ik heb meestal voordelen bij gestandaardiseerde processen
X46: De organisatie heeft meestal voordelen bij gestandaardiseerde processen.
X47: Ik vindt de meeste standaard processen prettig.
X48: Ik ben van plan om alles te doen wat binnen mijn mogelijkheden valt om het gestandaardiseerd ontwerp proces te ondersteunen.
X49: Gestandaardiseerde ontwerp processen helpen meestal om onaangename situaties op werk te verbeteren.

Hoe tevreden denk jij dat de onderzoeker wordt van jou antwoorden: 1) Verdrietig, 2) Neutraal, 3) Blij

Appendix C: Basic Statistic Theory

This appendix aims to concisely present some theory in notions very important in statistics. Notions like associations, covariance, correlations and regression coefficients are discussed. Also the basic idea of hypothesis testing is presented in the next section 2. Section 3 of this appendix discusses the basic assumption of regression analysis. Section 4 presents some information on Likert scale data. Mainly section 4 presents what is Likert-data and in section 5 how this data are misused and their limitations are argued.

Section1: Theory of Regression Analysis and Associated Notions

For better understanding of some core theory is necessary to be presented. The concepts of correlation, linear association, correlation coefficient and determination coefficient must be explained. In some cases researchers are trying to explain why a variable or a construct is affected or has a particular value. To do so researchers are trying to find relationships of that variable to other variables and try to make inferences based on some statistical analysis. A very typical example is the question if lung cancer is associated with smoking. Researchers take a sample of diseased lung cancer people and measure past or present smoking habits. The results could be that people who were smoking more than 3 cigarettes per day for a specific period of time disease now due to that habit. Generally statistics try to explain in mathematical terms from a given sample of population the whole population under study. Statistical analysis goals can vary. In this research the goal is to explore the relationships between variables. Therefore the concepts mentioned before are strongly associated to this research.

In statistics correlation means a technical term to describe association. Therefore association exists when variables are in relations at their levels, Figure 18 shows some correlation types.

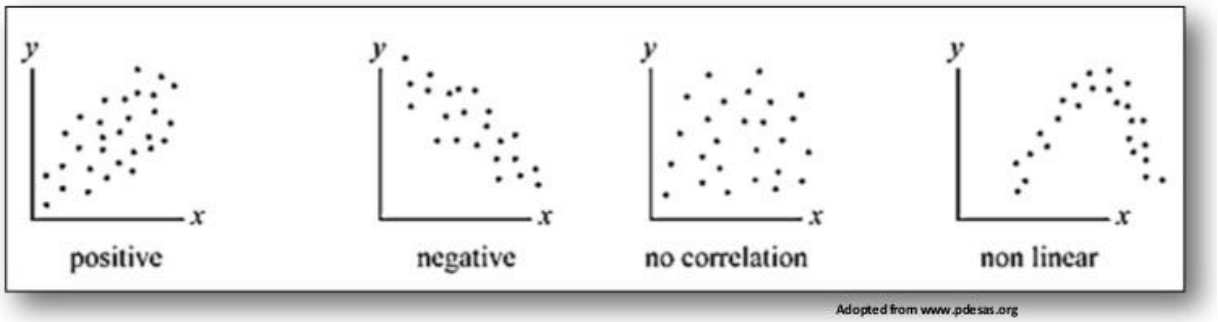


Figure 18: Correlation types

The above figures presents some information but do not present the strength of the association. For instance positive diagram presents that when variable x has high values then variable y has also high values. In negative association the opposite association exists, low x with high y. In order to define the strength of that association Karl Pearson in 1896 introduced a formula for measuring correlation between variables.

$$r_{xy} = \frac{\sum_1^n (x_i - \bar{x})(y_i - \bar{y}}{\sqrt{\sum_1^n (x_i - \bar{x})^2 \sum_1^n (y_i - \bar{y})^2}} = \frac{cov(x,y)}{s_y s_x}$$ (Pearson's Correlation Coefficient)

Where n the sample size and $\bar{x}, \bar{y}$ are the mean values of x and y respectively while S represents the biased version of standard deviation of each variable. The numerator fraction $cov(x, y)$ shows how much x and y change together. Pearson's correlation coefficient is the normalized version of the covariance and shows the magnitude of the strength. If you assume in the positive association that a line with equation y=bx+α (b higher than zero) represents the data perfectly and describes the association then r_{xy} becomes one while in the negative association the line equation becomes y=bx+α (b less than zero) then r_{xy} becomes minus one. Figure 19 shows all possible linear associations and the value of relevant pearson's correlation coefficient. Pearson's correlation coefficient is dimensionless number and the direction of calculation is not important i.e. $r_{xy} = r_{yx}$.

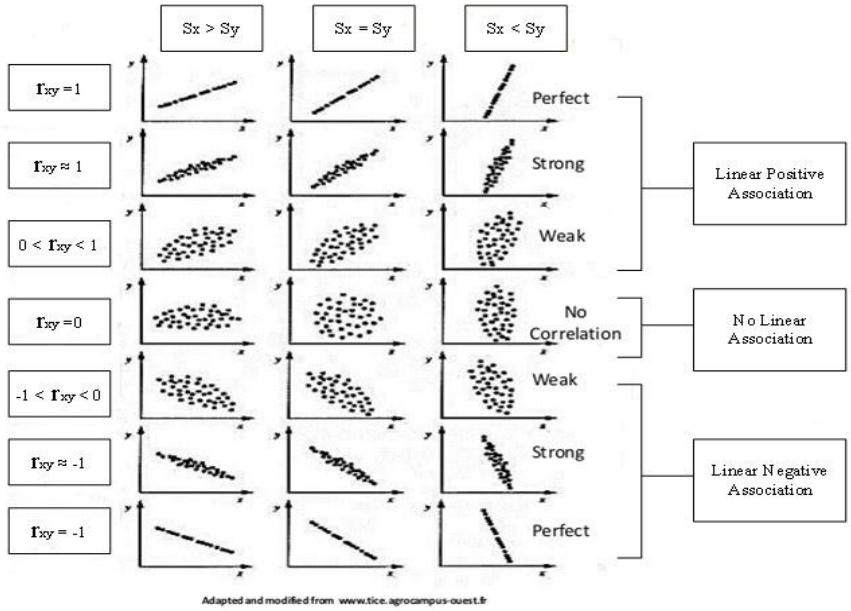


Figure 19: Linear correlations

It is very important to clarify that this associations or correlations do not prove causality. In causality the direction of the influence is important, like x cause y or vice versa, but in correlation direction does not matter.

Referring back to the line equation we assumed that variable y equals ($bx+\alpha$) where b is the slope of the line and α is the intersection with the vertical axis y. On a scatter diagram, there is one line of best fit or otherwise the regression line. Later in the section the idea of how this line is produced will be explained. The choice of this line depends on the goodness of fit which is represented by the determination coefficient r^2. The idea of determination coefficient can be better understood by Venn-Euler diagrams. Determinant coefficient can range within the values 0 and 1.

	**$r^2 = 0$, none of the variation of y can be determined by x (no linear association)**
	$r^2 \approx 0$, small percentage of variation of y can be determined by x (weak linear association)
	$r^2 \approx 1$, large percentage of variation of y can be determined by x (strong linear association)

 x=y	r^2 = 1, all variation of y can be determined by x and no other factor (complete linear association)

Table 52: Determinant coefficient values

The relationship between determinant coefficient and correlation coefficient is given by the following equation: $r^2 = b^2\left(\frac{\sum_1^n (x_i-\overline{x})^2}{\sum_1^n (y_i-\bar{y})^2}\right) = b^2(\frac{s_x^2}{s_y^2})$ or $r_{xy} = \pm\sqrt{r^2}$where b is the slope of the regression line, or regression parameter/coefficient of the regression equation.

The rest part of this section focuses on the regression analysis itself. Knowing that two variables are linearly associated is not enough in explaining the variation caused in one variable based on the variation of the other variable. Regression analysis is a statistical tool for the investigation of this variation between variables. Regression analysis aims to estimate how a variable or a group of variables affects another variable. The latter is known as depend variable while influencing variables are known as independent variable or explanatory. Table 33 shows which variables are considered independent or dependent in our analysis. When researcher investigates relationship between only two variables, one independent and one dependent, then the analysis is considered "simple regression". In any other case when number of independent variables increases regression analysis is considered "multiple regression". In other words researcher tries to predict which is the value of the dependent variable measured by independent variables. Researcher collects data on the underlying variables of interest which uses for the analysis. Regression models can be linear or non-linear.

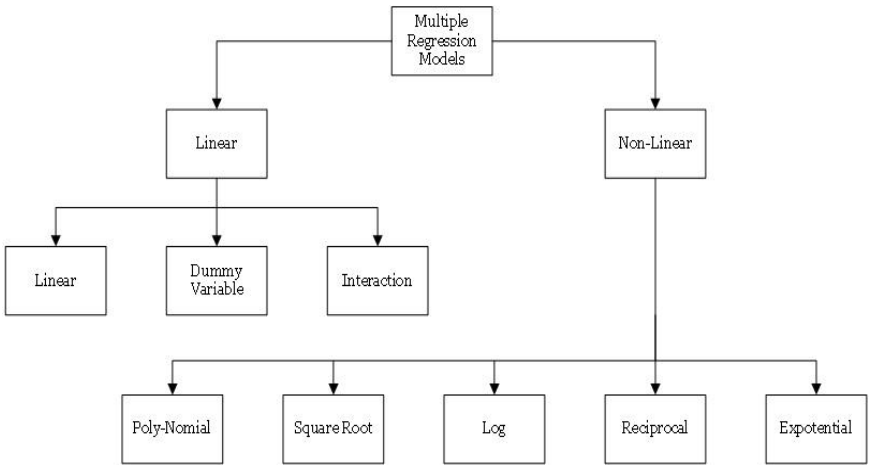


Figure 20: Multiple regression models

Multiple Linear[33] Regression results in an equation of the following form:

$$Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + \cdots + b_nX_{ni} + e_i \ (1)$$

Where: $X_1 + X_2 + \cdots + X_n$ are n independent variables. b_i (coefficient parameter) is the effect of the variable X_i on the dependent variable Y if all other variables are constant. Letter b_0 is a constant amount while e_i is the "noise" or "error" term reflecting other influential variables which are not considered in the model and ignored. Finally Y is the predicted dependent variable.

The task of the regression analysis is to estimate constant amount b_0 and coefficients b_i based on some assumptions about e_i. In simple regression analysis equation form results to:

$$Y_i = b_0 + b_1X_1 + e_i \ (2)$$

The first part, $b_0 + b_1X_{1i} + b_2X_{2i} + \cdots + b_nX_{ni}$, of the regression equation is called sample regression function (SRF). Obviously it is named sample regression function because the values yielded are from the sample and not from the entire real population. If we assume that error noise is zero which entails a deterministic model rather than a stochastic then sample regression function can be remaned as population regression function (PRF) because it represents the real world. That of course is a huge

33 Linear relationships are the simplest forms.

assumption and not true. Let's illustrate an example to make it clearer. If for example Y dependent variable the weight of an adult and the independent variables are gender, sports, study and free time. By including these explanatory variables in the model obviously not all factors are included. Obviously one extra factor influencing weight is eating habits. By removing error term for equation it is automatically assumed that our model represents perfectly the real situation. This assumption is very difficult to be proved. Therefore error term or a stochastic random term needs to be included in the mathematical model.

If we want to understand how parameters b_0 and b_i are generated let's ignore for the sake of the example noise term e_i . Equation (2) becomes a straight line. If dependent variable is plotted on vertical axis and independent variable X_i on horizontal axis then constant b_0 is the intercept of line 2 with the vertical axis and a slope of b_1. If we then put all the data on scatter diagram then the relationship we hypothesize entails that this line should be found somewhere among data. The best location of this line is strongly connected on how we think about the nature of noise term e_i. That problem will be described in a moment.

If we choose a large negative e_i then the value of $Y_i = b_0 + b_1 X_1 + e_i$ becomes less than the true value of $Y_i = b_0 + b_1 X_1$. The opposite occurs when e_i is large positive number. In first case we would like to pick a line that lies far above data or below data in case of positive e_i. Regression analysis assumes error term equal to zero so line lies in the midst of the data. The selection of the best line is based on the minimization of errors or the minimum sum of squared errors called also Ordinary Least Square (OLS) method.

In the case of simple regression the line passes from a certain point which is the mean value of variable X and Y (figure 18). Based on this first estimated regression line the least square method will estimate the best suitable line on the data by minimizing the errors. The line which has the minimum errors is

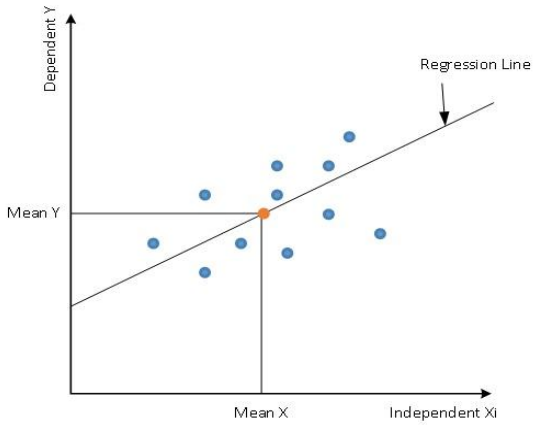


Figure 21: Stable point of regression line

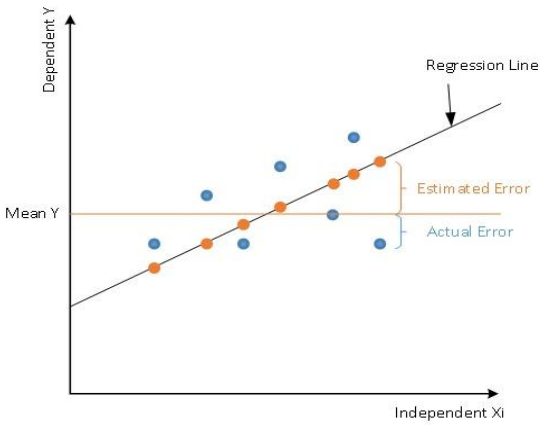


Figure 22: Actual and estimated errors

considered most suitable. Solving equation one for error it is obvious that error is a function of slope b_1 and intercept b_0 concluding to $\sum e_i^2 = f(b_0, b_1)$ (3). For the sake of brevity equation solving is not presented but only the result. After optimizing equation (3) b_1 is calculated to be equal to $\frac{\sum (x_i - \bar{x})(y_i - \bar{y}}{\sum (x_i - \bar{x})^2} = \frac{cov(x,y)}{S_x^2}$ where $s_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$ is the biased version of sample standard deviation.

The error is defined as the distance between the estimated minus mean value (estimated error) and actual minus mean value (actual error). The sum of squared estimated errors divided by the sum of squared actual errors gives the R^2. The line with the lowest R^2 value is the most suitable.

In multiple regression analysis the effect of multiple variables on the dependent variable can be estimated. Multiple regression analysis will produce a minimized "hyperplane" in n-space where n the total number of independent variables. Its intercept with Y axis implies a constant value b_0 and a slope b_i at each dimensional axis.

Therefore $b_1$and b_0 which are estimators of the real values β_1 and β_0 , are obtained thought optimizing equation (3). In order to test hypothesis on the real values $(\beta_0, \beta_1, \dots, \beta_n)$ information is required regarding the distributions of their estimators $(b_1, b_0, \dots, b_n)$. So some assumptions are made about the independent variables and the real error term which are discussed in a following section.

Section 2: Hypothesis Testing Theory

Hypothesis testing is a claim or premise that researcher wants to test. In most cases a statement about parameter estimates is set and then tested on its truthiness based on a specified level of confidence. In reality the population we want to measure is most of times very large so collecting data representing the entire population is very time consuming process and costly. For that reason a sample is gathered and analyzed in order to make conclusion about the real population. Like presented in the previous section regression analysis calculates coefficient parameters b_i. The true value of each parameter β_i or otherwise population value lies in the real population. Therefore estimator parameters or coefficients are just an estimation of the reality. The idea of making statements or claims about a population based on a sample is called inference in statistics.

When sample data size increases infinitely ($n \to \infty$) and based on all above assumptions then distribution of estimated parameters tends out to be normal distribution with a mean close to the real parameter value and a standard deviation being a function of the error in analysis i.e. $b_0 \sim N(\beta_0, \frac{\sum X_i^2}{n \sum x_i^2} \sigma^2)$ and $b_1 \sim N(\beta_1, \frac{\sigma^2}{\sum x_i^2})$ where σ^2 is the variance of error term. The error, which affects the distribution of the coefficient parameters, is considered to be normally distributed with zero mean and given variation but in reality it cannot be observed. In other words the standard deviation of the coefficient distribution is a function of an unobserved parameter/error. So we estimate the value of the error variance via the following formula $\hat{\sigma} = \sqrt{\frac{\sum e_i^2}{n-k}}$ when there is k parameter in the model. Due to that uncertainty around the standard deviation of coefficients we refer to other statistical distributions called t-distribution or Z distribution. T-distribution is more suitable when we do not have any prior knowledge about the variance of the error and we estimate via the formula. The result of that distribution is wider variance of the model or otherwise more open bell curve but same mean. T-distribution is defined as a fraction of estimated parameters b_i divided by the standard error of the same parameter i.e. $t = \frac{b_1 - \beta_1}{\frac{\hat{\sigma}}{\sqrt{\sum x_i^2}}}$.

Under the context of regression analysis the null hypothesis is usually set as b_i equals to zero and the alternative hypothesis assumes b_i non-equal to zero. In null hypothesis we assume that the t-distribution is centered around zero and in the alternative hypothesis t-distribution is centered at a value greater or lower than zero or at any other value desired.

Section 3: Assumptions of Regression Analysis

In regression analysis noise term e_i can be thought as random variable which is drawn by probability distribution. Nature generates an error number for each individual and it affects, in our case, the commitment of people toward changes (dependent variable). Then reasonably the coefficients $(b_1, b_0, \dots, b_n)$ are drawn from a probability distribution as well since error is function of the estimated coefficients. Likewise we can think that each individual has a specific coefficient value. Interesting point is how close the probability distributions of estimated coefficients are to the real coefficient probability distributions. Furthermore the nature of explanatory variables is considered non-stochastic.

In regression analysis the estimator (the method of minimizing squared errors) is considered (1) unbiased. That means that if we consider that coefficient estimates are random variables and we repeat the test for the same individuals each time but for different random noise terms (e) then the estimator will result on average the same coefficient estimates. Additionally estimator is considered to be (2) consistent, that means it takes advantage of additional data to create more accurate data. Finally (3) efficient estimators are most attractive since they reduce the probability of an estimate to differ greatly from the true values.

In order to have an unbiased, consistent and efficient estimator two main assumptions should hold. First assumption is that each noise term ε for every observation is drawn from a probability distribution with a mean of zero. That is: $u_i \sim N(0, \sigma^2)$. If this assumption is true then logically we can assume that all independent variables X are uncorrelated to noise variable e_i i.e. $cov(u_i, x_i) = 0$. The above assumption ensure unbiased and consistent estimator while efficiency is produced when noise terms are statistically independent i.e. $cov(u_i, u_j) = 0$ (u is the real error value), and have the same variance. When variances

of terms e_i are large then linear estimators are not the best. We assume in this research that in all observations the variance of term e_i is not big. We can partly argue that this assumption is correct because most individuals are grown in the same society and culture therefore possibly the variance of noise term will not vary strongly among individuals.

The assumption that explanatory variables are uncorrelated to noise variable can be violated if there are omitted independent variables. We conclude with 5 explanatory variables via literature study. Even if literature study has successfully covered all possible constructs, there might be unobserved constructs affecting the psychology of individuals to stay committed to changes. Any omitted variables will affect the constant term b_0, regression coefficient R^2 , and coefficient of variables X since now they represent not only the effect of the associated measuring construct but also the effect of omitted variables. A closer explanation of our research is reasonable at this point. We have seen in chapter 3 that Holt, Armenakis, Feild, Harris (2007) developed and tested a measuring scale of change readiness. In that model the analysis showed some people cannot separate the notions discrepancy and appropriateness (or organizational valence). Therefore these notions have been clustered into one variable. Most of the constructs measured in this project slightly overlap in definition and possibly have strong correlation due to their unobserved nature. Additionally we see that attitudes have three measuring components and people can belong in all three at the same time. That entails difficulty in capturing only one component as attempted in our research. Even if questions are addressing to some extent a clear underlying notion the effect of the other two notions on regression results will be important. In other words there are independent variables not taken into consideration and therefore the independent variables taken into account cannot be considered fully uncorrelated to noise variable e_i (assumption of unbiased estimator). The results are more biased estimations of coefficients of the model.

Another typical problem in regression analysis is multicollinearity. The problem stems from the difficulty to separate the effects of two or more variables on the dependent variable. The problem is usually generated when strongly correlated explanatory variables are included in analysis. When strong correlation exists then coefficient of one variable captures the effects of the other. That results in

increased standard coefficient errors and in result low confidence can be placed on them. In our case, someone can reasonably claim that leadership support can create confidence. These are both independent variables in our regression analysis therefore the effect of one variable is overlapped by the other on the dependent variable. In the same reasoning attitudes can overlap with confidence or appropriateness with attitudes because if the benefit to the organization is high then feelings of people could increase therefore part of appropriateness effect on dependent variable is captured by attitudes.

Section 4: What is Likert Data

A Likert scale is a psychometric scale most often used in research with questionnaires. The term originates from its inventor psychologist Rensis Likert. Rensis Likert tried to create a procedure for measuring attitudinal scales. The problem originates from the difficulty in measuring psychological traits in quantitative scales. He originally developed five response alternatives to a number of questions in gradation approval to disapproval: strongly approve (1), approve (2), undecided (3), disapprove (4), and strongly disapprove (5). Nowadays variations of this form are used excluding even neutral response. Although the variations are commonly used by researchers mistakes or misuses are still happening regarding analyzing data. In order to describe usage limitations some concepts must be made clear. Dormody (1994) describe the difference between Likert-type and Likert scales. Likert-type items are single questions that use some sort of the original's response form. While Likert scales are multiple questions attempting to measure a construct when responses to questions are combined. The measurement degree of that construct should be investigated. In our research, as presented in chapter 3, Likert scales have been tested for their reliability.

Section 5: Analyzing Likert Response Items

The analysis used in each approach differs due to data interpretation. To make it more clear Steven's Scale of measurement will be presented. It consists of four categories: Nominal (or categorical), Ordinal, Interval, and Ratio variables. That separation of variables is really important to be understood for analysis mistakes.

Nominal Variables: A nominal variable has two or more categories but there is not inherent ordering to the categories. Typical examples are gender and hair color. In this case there is no clear order of the variable. Differences in gender are almost impossible to be ordered even though some sort of ordering is possible with basic assumptions. When variables have a sort of ordering then clustering is possible.

Ordinal Variables: As already mentioned the difference between nominal and ordinal variable is the clear ordering of the variable. An example, for instance, could be educational experience variable. We order educational experience as elementary school, high school, some college, and college graduate experience. But another order could be for instance primary, secondary, and tertiary educational experience. Even though we can order education from lowest to highest the spacing between education levels is not the same across the levels. The difference between primary and secondary education level could be much lower than the difference between secondary and tertiary education level.

Interval Variables: The difference between interval variables and ordinal variables is that the difference between ordering levels is the same across levels. The simplest example is the difference between number 1 and 2 is the same between 2 and 3.

When the difference between levels is the same, that means interval elaboration, then average and variability can be measured with mean and standard deviation. But when variable is ordinal, using mean for calculating average does not give reasonable results. In general statistical techniques differ for each variable type.

Numbers assigned to Likert-type items express a "greater than" relationship, however, how much greater is not implied. Because of these conditions, Likert-type items fall into the ordinal measurement scale. Likert scale data, on the other hand, are analyzed at the interval measurement scale. Likert scale items are created by calculating a composite score (sum or mean) from three (3) or more type Likert-type items; therefore, the composite score for Likert scales should be analyzed at the interval measurement scale. (Harry, Boone, 2012).

In other words, in Likert-type items the distances between responses cannot be considered equal even if the numbers assigned to responses are. While in Likert scale equal distances are assumed. Sullivan Artino (2013) write that some researchers are claiming that when there is an adequate sample size, at least 5 to 10 observation per group, and if data are normally distributed then parametric tests can be used which requires interval interpretation of Likert-scale data.

Based on that assumption, questionnaire developers conduct factor analysis.

	Likert-Type Data	Likert Scale Data
Central Tendency	Median or mode	Mean
Variability	Frequencies, IQR	Standard deviation
Associations	Kendall Tau B or C	Pearson's r
Other Statistics	Chi-square	ANOVA, t-test, regression

Appendix D: Statistical Results

In this appendix some statistical results can be found. Section 1 presents all bar charts of all questions addressing commitment and change valence variables. Section 2 presents results of adequacy tests, scree plots of factor analysis and descriptive statistics of all change valence variables and commitment components. Section 3 shows all individual factor scores. In other words the scores of each individual on each change valence variable and commitment component are shown. Finally in section 4 some results regarding the assumption of regression analysis are presented. These are normal P-P plots of regression standardized residual and scatter plots.

Section 1: Results from non-parametric analysis

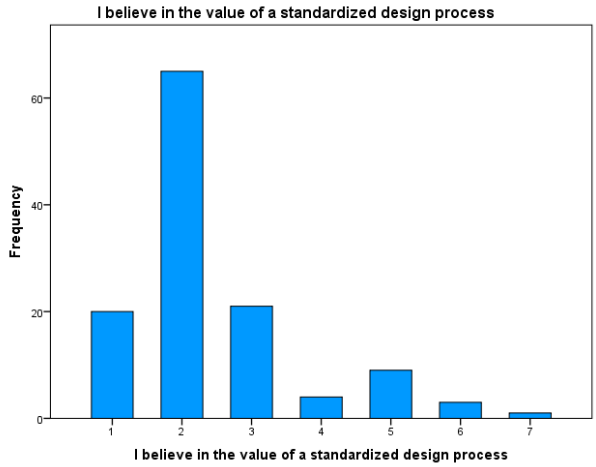


Figure 23: Bar chart of affective commitment question X1

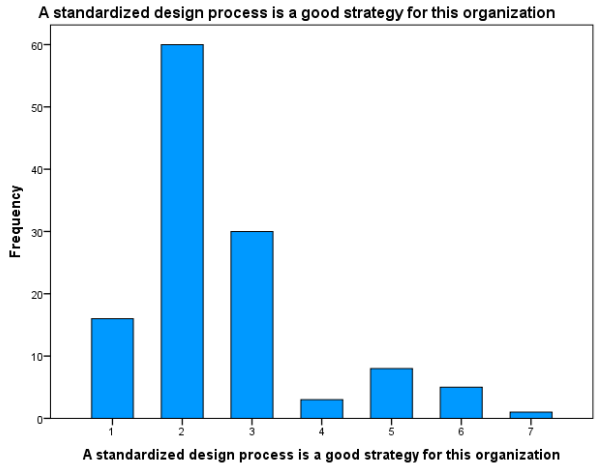


Figure 24: Bar chart of affective commitment question X2



Figure 25: Bar chart of affective commitment question X3

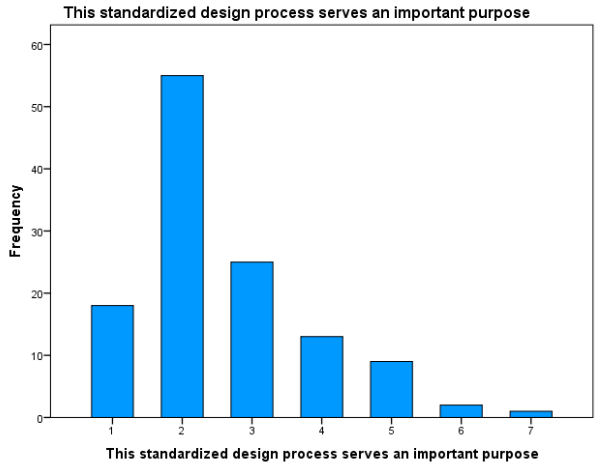


Figure 26: Bar chart of affective commitment question X4

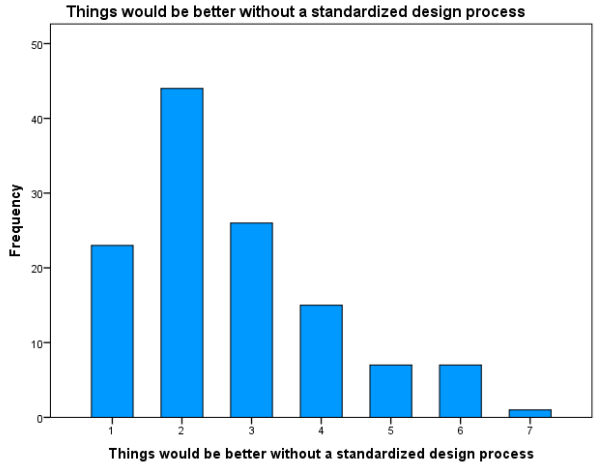


Figure 27: Bar chart of affective commitment question X5

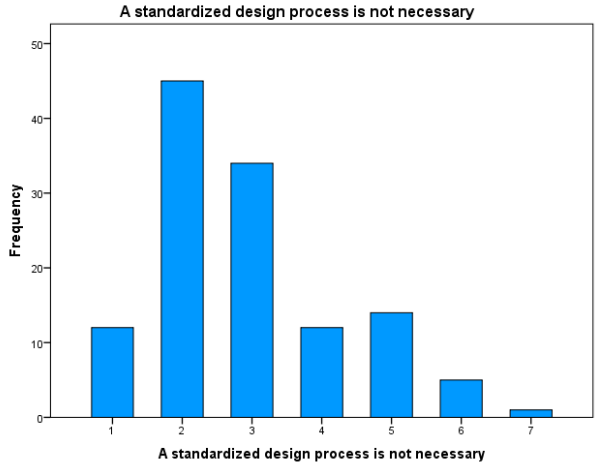


Figure 28: Bar chart of affective commitment question X6

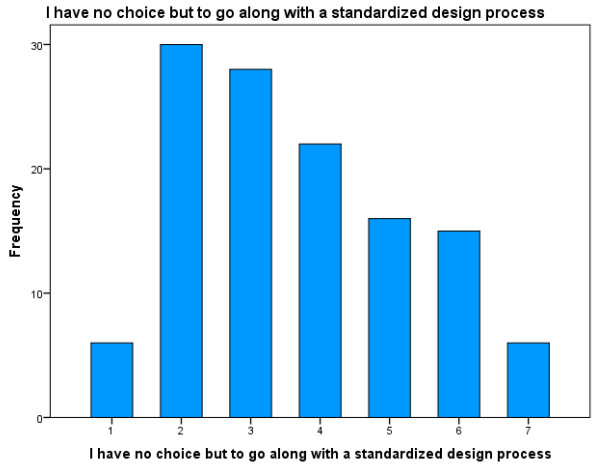


Figure 29: Bar chart of continuance commitment question X7

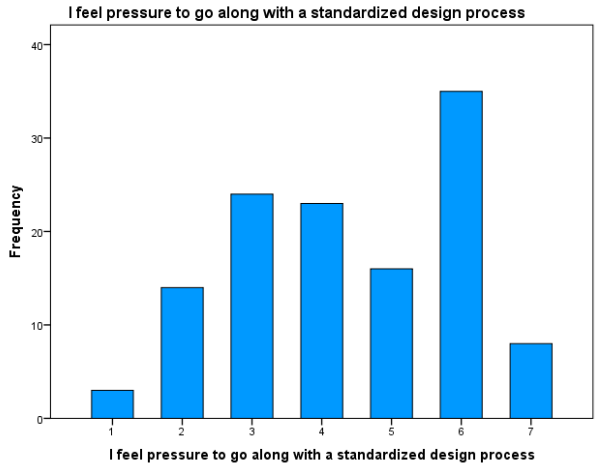


Figure 30: Bar chart of continuance commitment question X8

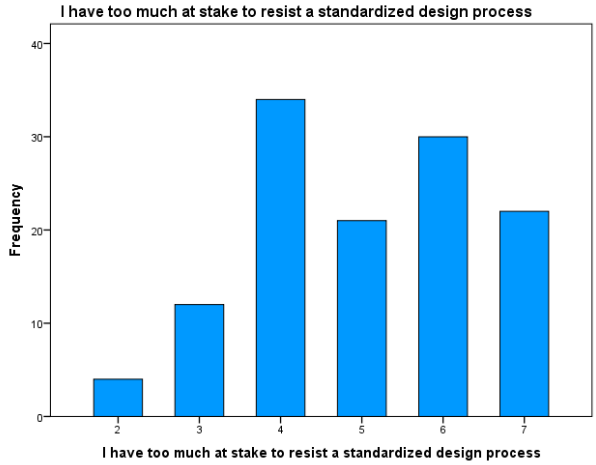


Figure 31: Bar chart of continuance commitment question X9

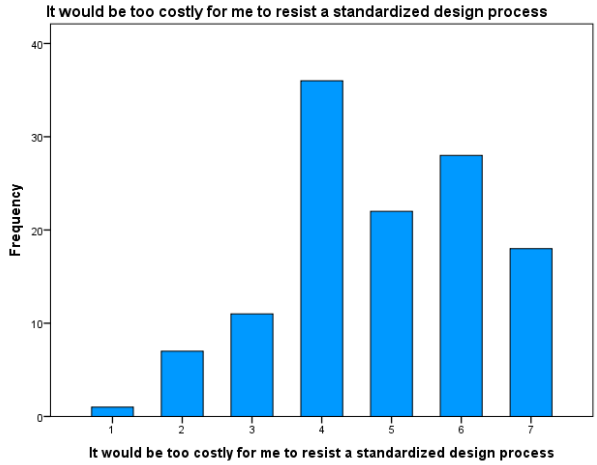


Figure 32: Bar chart of continuance commitment question X10

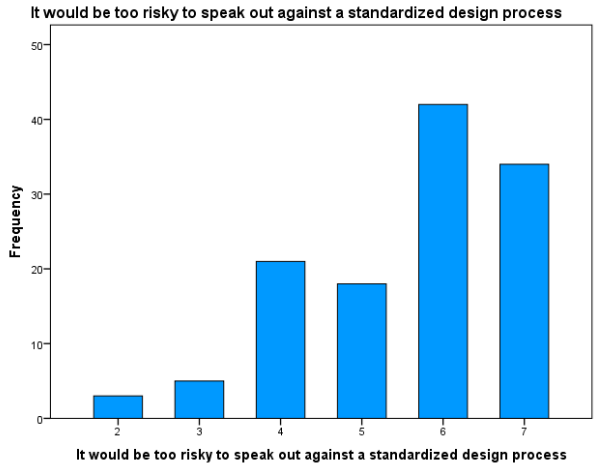


Figure 33: Bar chart of continuance commitment question X11

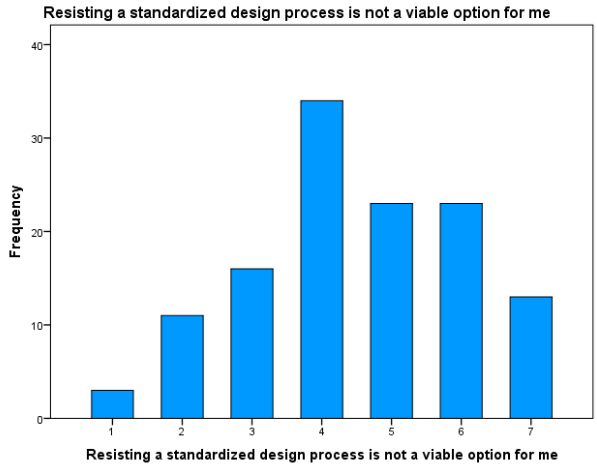


Figure 34: Bar chart of continuance commitment question X12

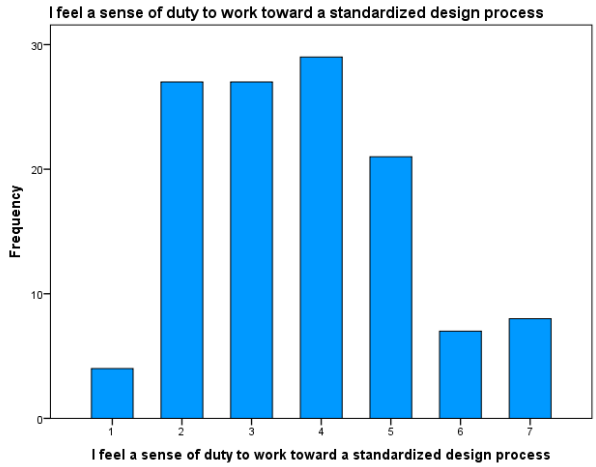


Figure 35: Bar chart of normative commitment question X13

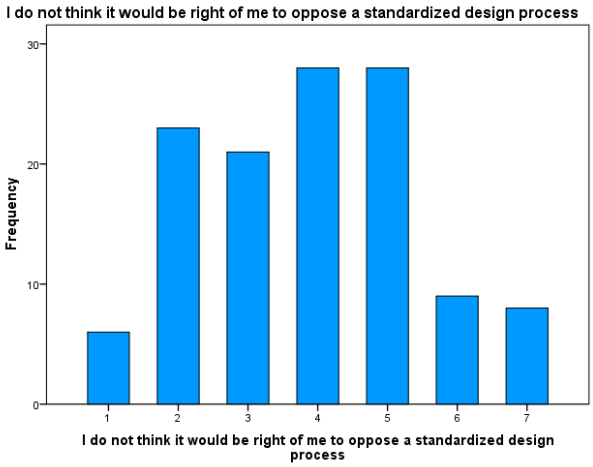


Figure 36: Bar chart of normative commitment question X14

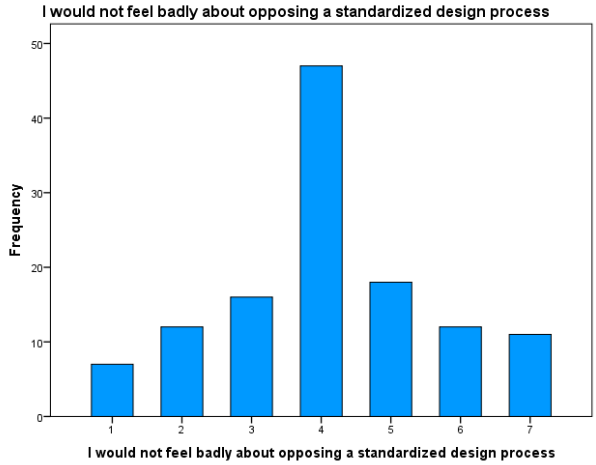


Figure 37: Bar chart of normative commitment question X15

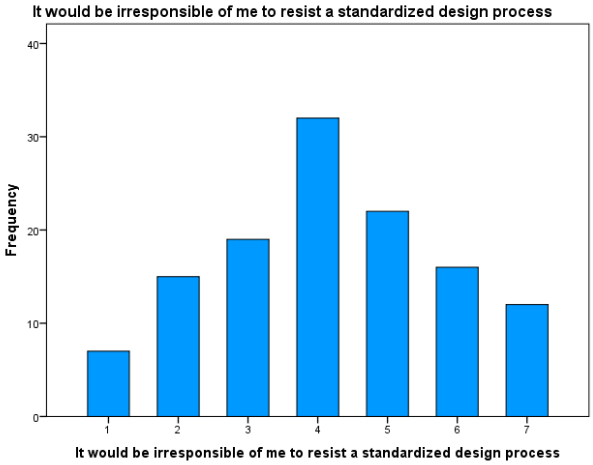


Figure 38: Bar chart of normative commitment question X16

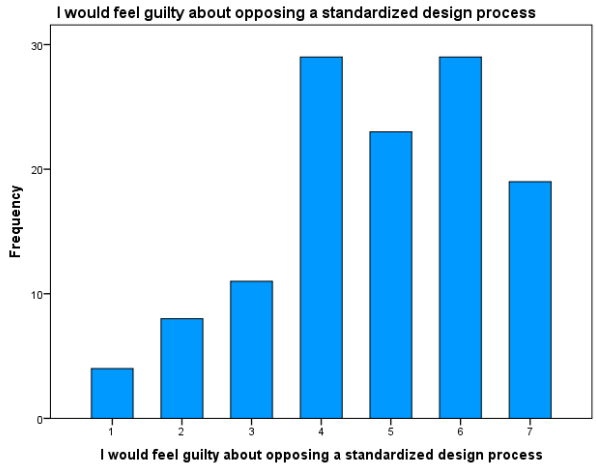


Figure 39: Bar chart of normative commitment question X17

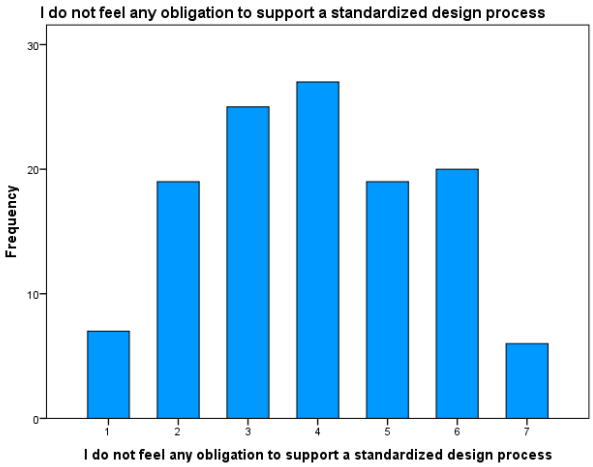


Figure 40: Bar chart of normative commitment question X18

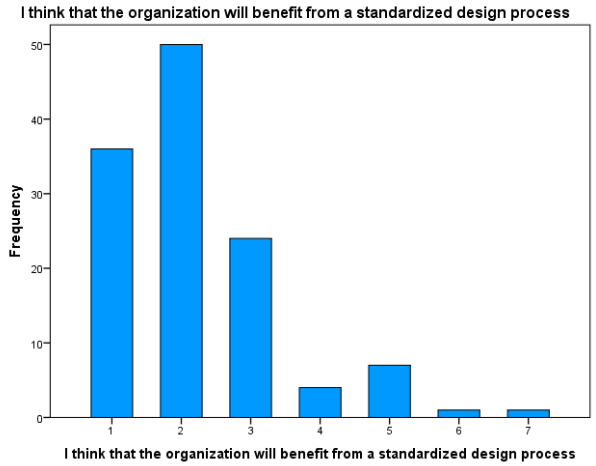


Figure 41: Bar chart of appropriateness question X19

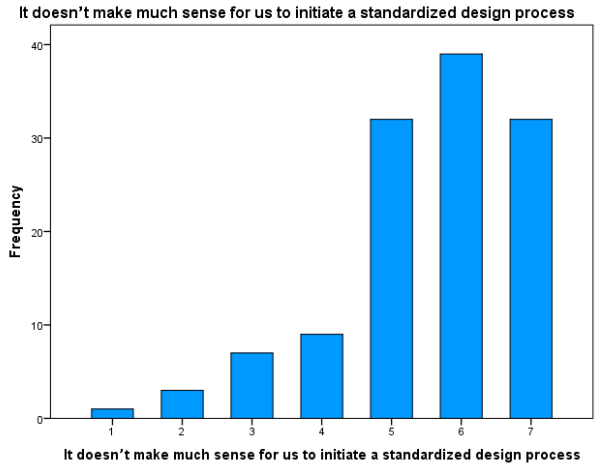


Figure 42: Bar chart of appropriateness question X20

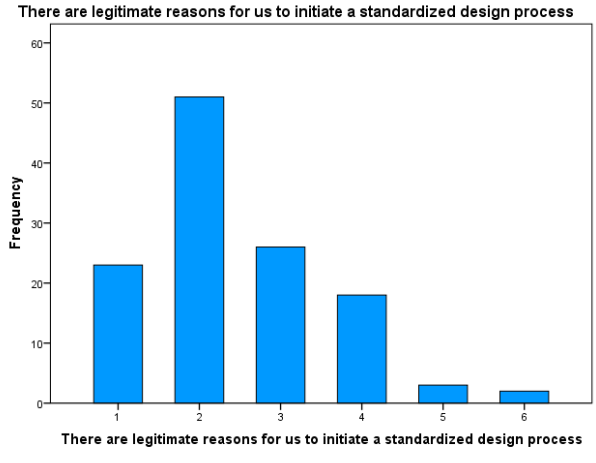


Figure 43: Bar chart of appropriateness question X21

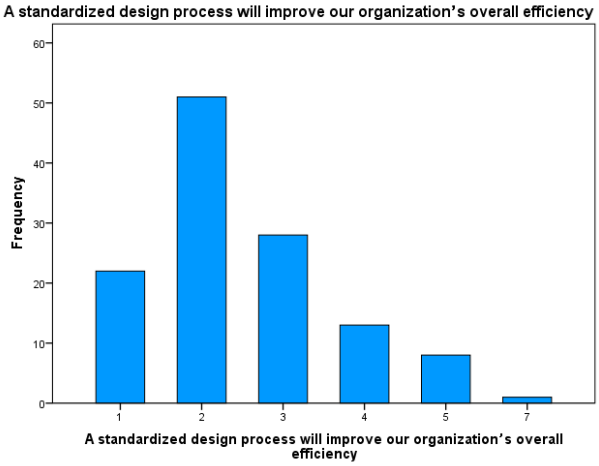


Figure 44: Bar chart of appropriateness question X22

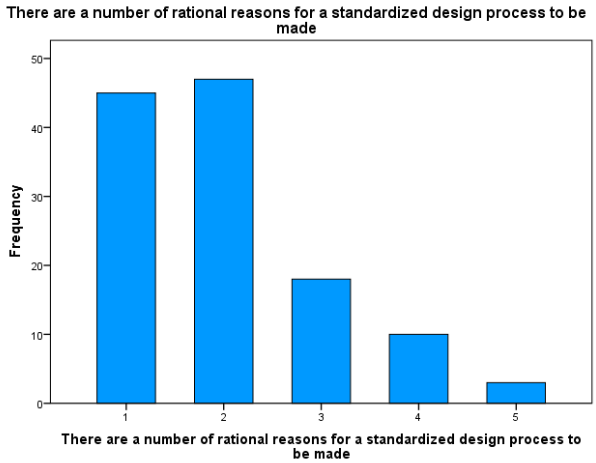


Figure 45: Bar chart of appropriateness question X23

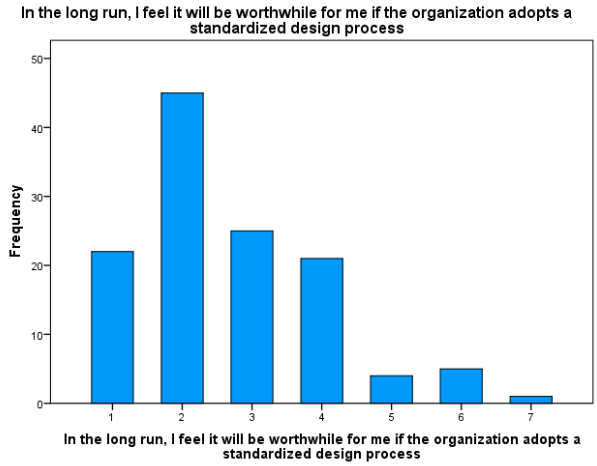


Figure 46: Bar chart of appropriateness question X24

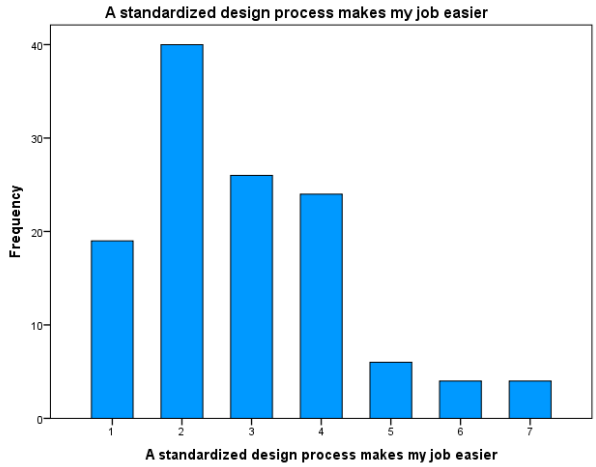


Figure 47: Bar chart of appropriateness question X25

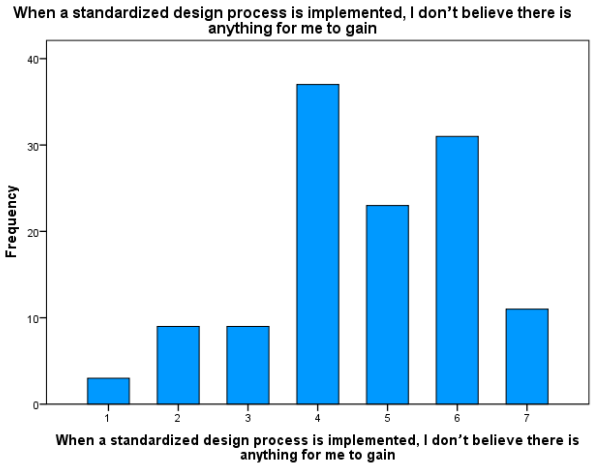


Figure 48: Bar chart of appropriateness question X26

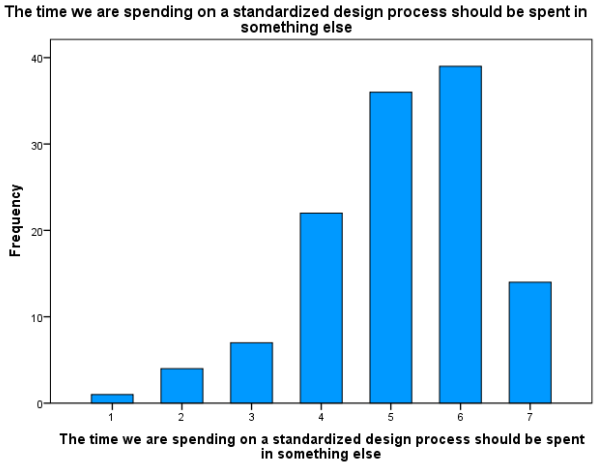


Figure 49: Bar chart of appropriateness question X27

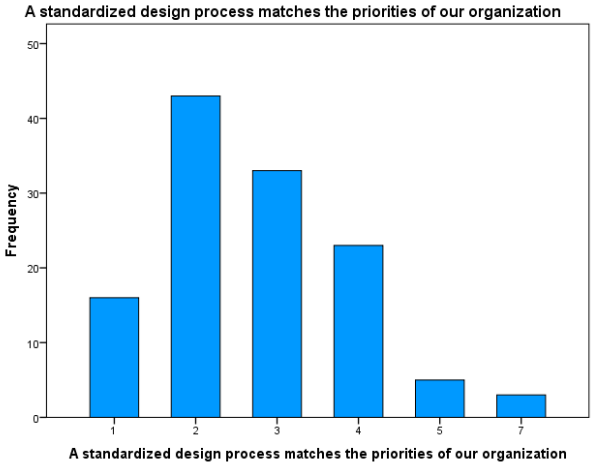


Figure 50: Bar chart of appropriateness question X28



Figure 51: Bar chart of leadership support question X29

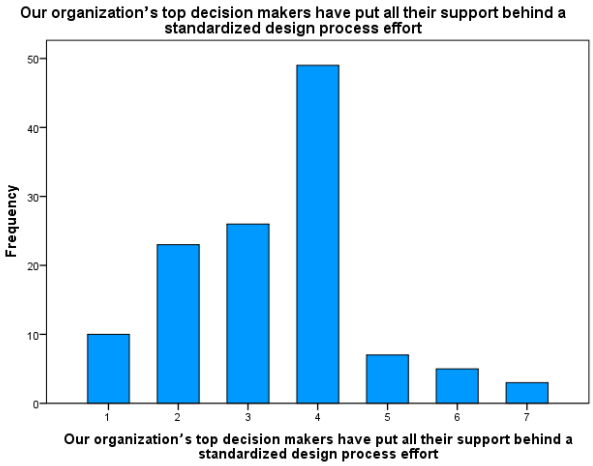


Figure 52: Bar chart of leadership support question X30



Figure 53: Bar chart of leadership support question X31



Figure 54: Bar chart of leadership support question X32

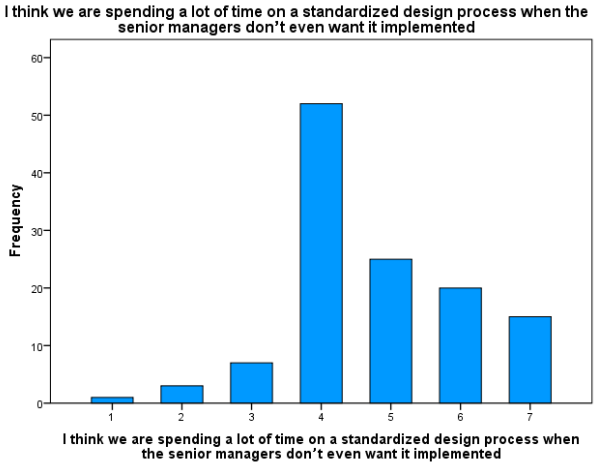


Figure 55: Bar chart of leadership support question X33

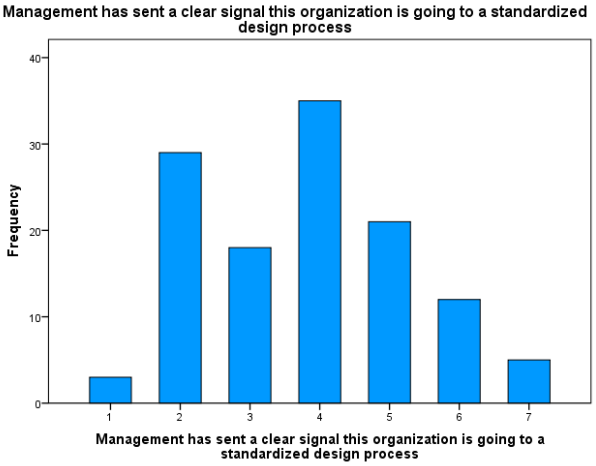


Figure 56: Bar chart of leadership support question X34

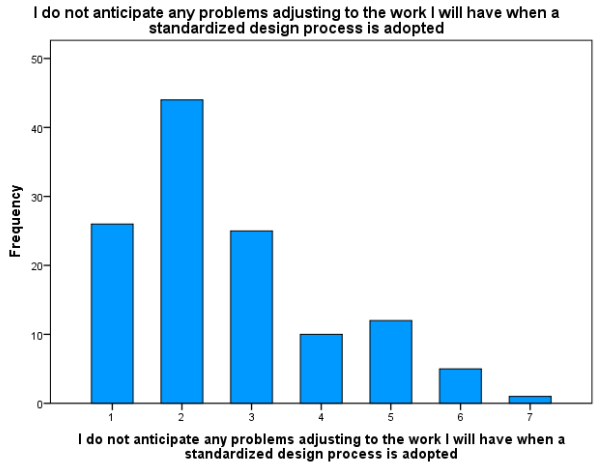


Figure 57: Bar chart of change efficacy question X35

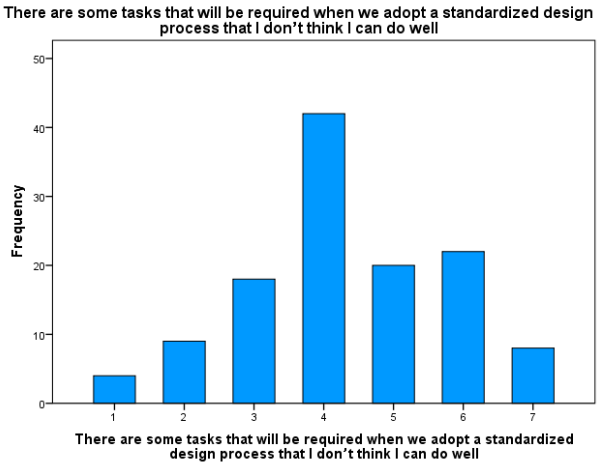


Figure 58: Bar chart of change efficacy question X36

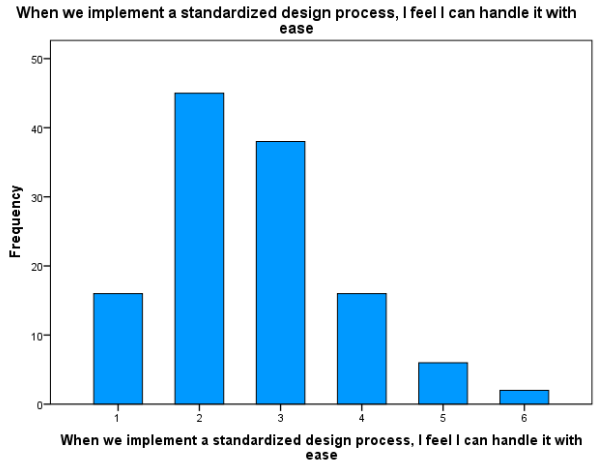


Figure 59: Bar chart of change efficacy question X37

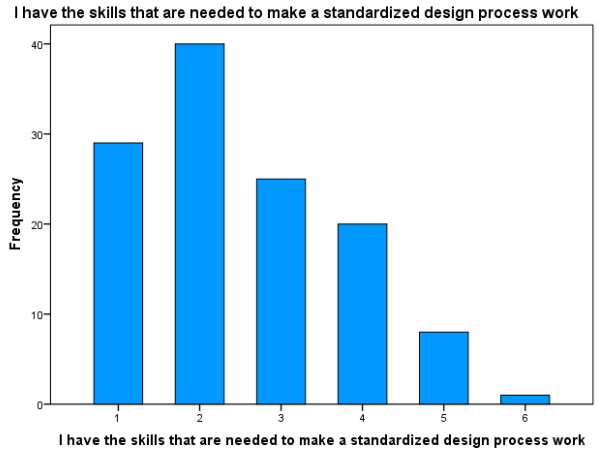


Figure 60: Bar chart of change efficacy question X38

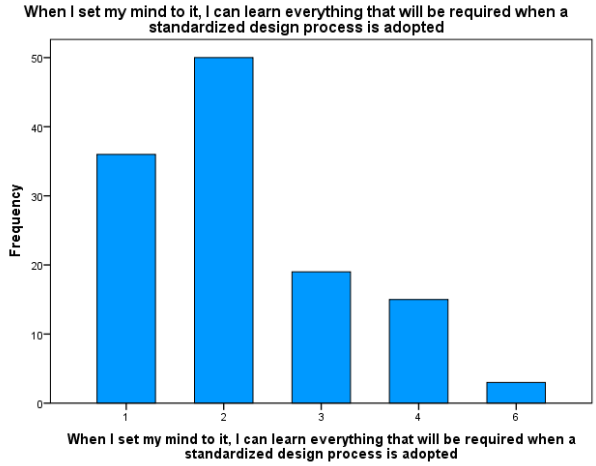


Figure 61: Bar chart of change efficacy question X39

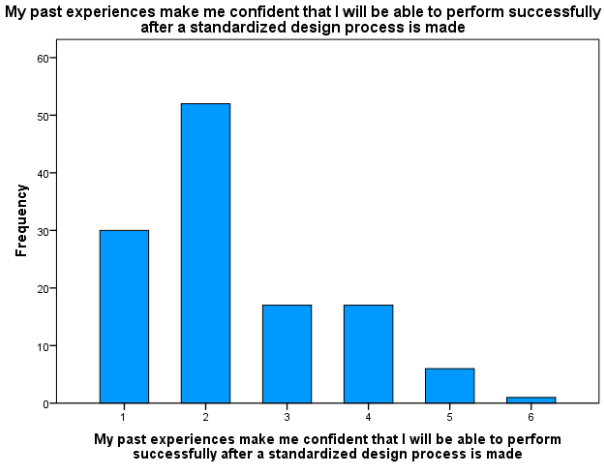


Figure 62: Bar chart of change efficacy question X40



Figure 63: Bar chart of personally beneficial question X41

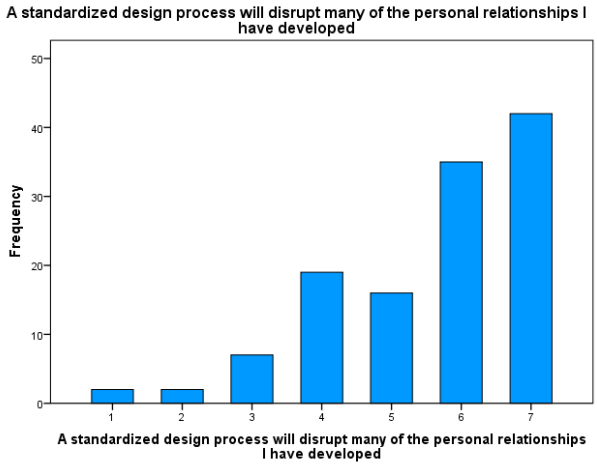


Figure 64: Bar chart of personally beneficial question X42

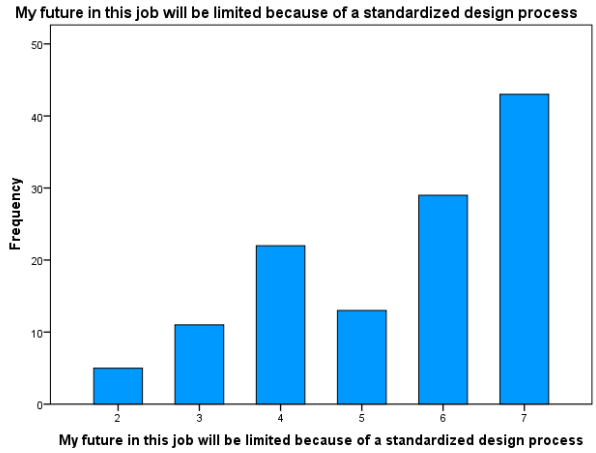


Figure 65: Bar chart of personally beneficial question X43

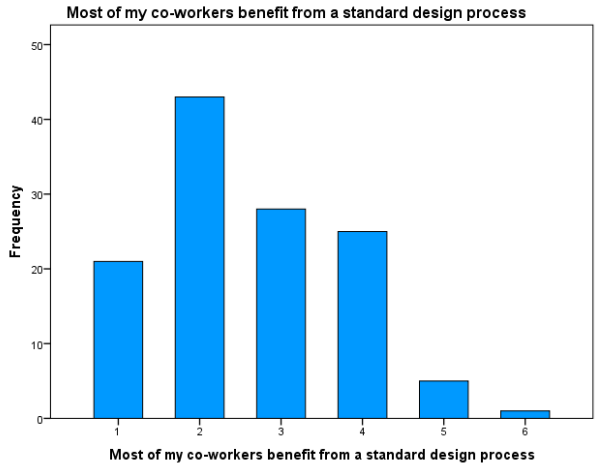


Figure 66: bar chart of cognitive attitude question X44

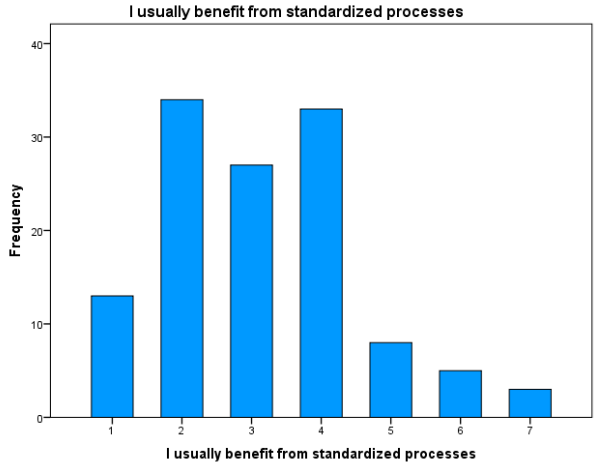


Figure 67: Bar chart of cognitive attitude question X45

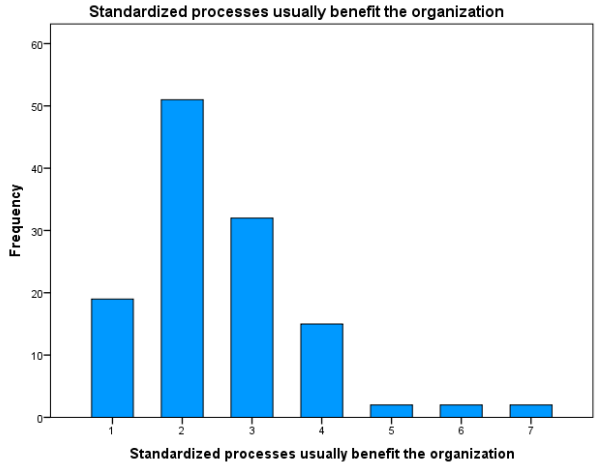


Figure 68: Bar chart of cognitive attitude question X46

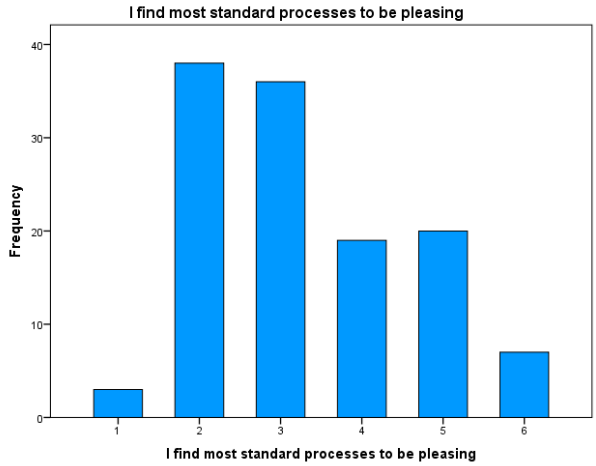


Figure 69: Bar chart of cognitive attitude question X47

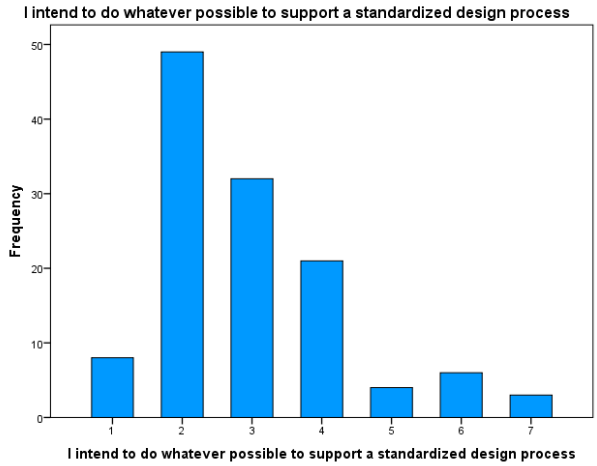


Figure 70: Bar chart of cognitive attitude question X48

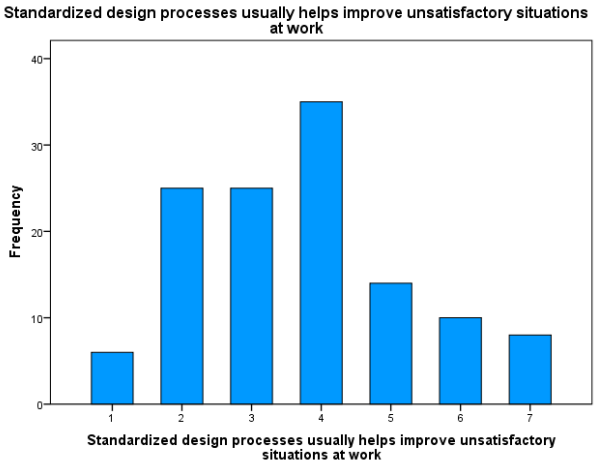


Figure 71: Bar chart of cognitive attitude question X49

Section 2: Results from parametric analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,838
Bartlett's Test of Sphericity	Approx. Chi-Square	1028,588
	df	105
	Sig.	,000

Table 53: Adequacy test of commitment model

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,855
Bartlett's Test of Sphericity	Approx. Chi-Square	1764,447
	df	276
	Sig.	,000

Table 54: Adequacy test of change valence model

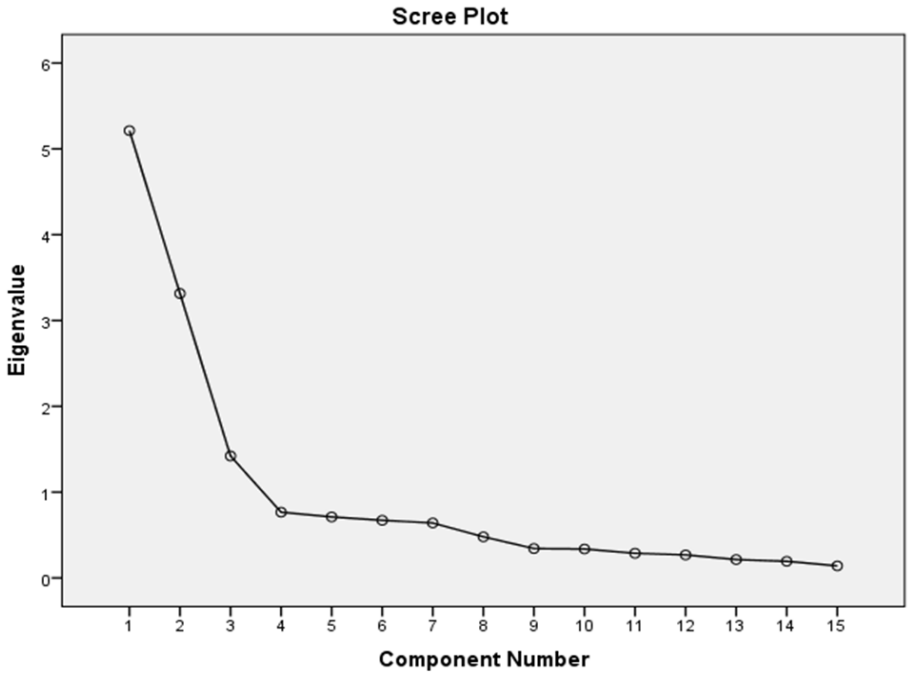


Figure 72: Scree plot of final commitment factor analysis

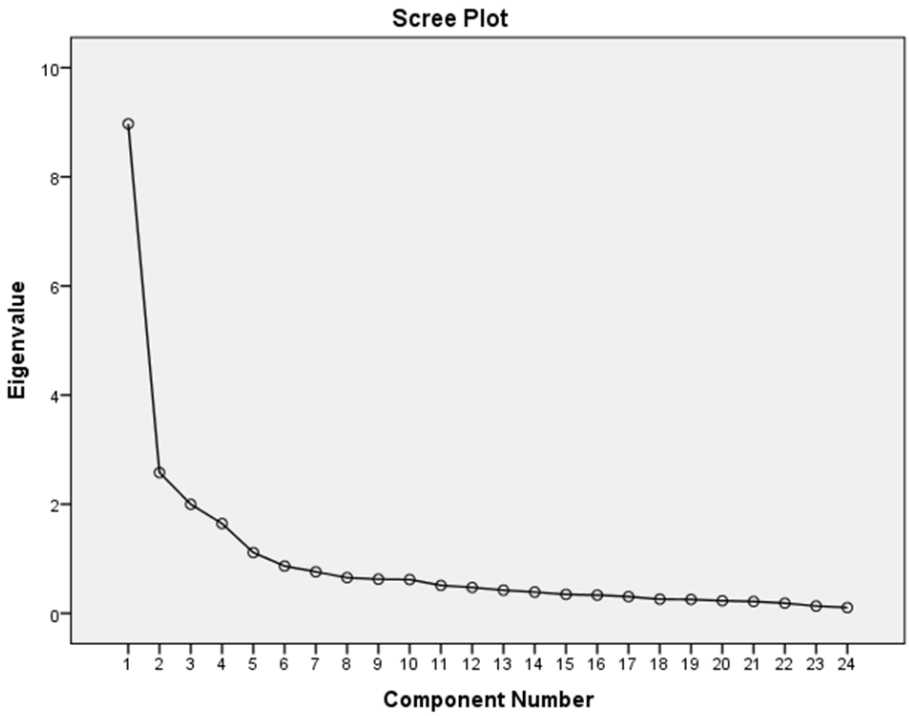


Figure 73: Scree plot of final change valence factor analysis

Descriptive Statistics			
	Mean	Std. Deviation	N
ACS	2,6140	1,10539	123
CCS	4,9445	1,09990	123
NCS	4,1578	1,27369	123
APPR	2,6139	,96409	123
SUP	3,6488	1,19248	123
EFF	2,7146	,92263	123
BEN	2,3959	1,27722	123

Table 55: Mean and Standard deviation of final variables

Section 3:Individual scores on measured constructs.

	Construct Scores						
Individuals	ACS	CCS	NCS	APPR	SUP	EFF	BEN
1	2,28	4,87	6	2,62	2,96	2,45	2,32
2	2,28	4,93	2,7	3,47	2,75	2,57	4,72
3	2,28	3,74	3	2,35	2,53	3,67	2,01
4	2,52	4,49	5,21	1,86	3,69	1,9	1
5	1,49	3,43	2,96	1,22	2,77	2,12	2,01
6	1,85	4,65	4,43	1,92	1,98	3,08	1
7	3,41	4,45	4,17	4,42	5,06	4,92	4,53
8	2,13	5,51	3,11	2,53	2,24	2,38	1,62
9	1,82	3,57	1,91	2,68	2,96	1,59	2,01
10	2,46	6,01	5,1	1,6	2,26	2,12	2,01
11	3,18	6,75	4,64	3,58	5,08	2,5	2,01
12	1,13	6,28	5,56	1,31	2,49	1,81	1
13	5,33	6,01	6	2,71	5,24	1,74	1
14	1,85	4,74	3,36	2,26	2,5	3,05	2,01
15	2,21	4,75	3,59	2,77	2,48	3,27	3,33
16	1,38	3,43	2,77	1,88	3,95	2,16	2,32
17	3,7	4,43	4,12	3,87	3,73	3,29	4,72
18	2	5,49	4,86	2,12	4,69	2,67	1
19	2,12	6,52	5,58	2,03	3,51	1,38	1
20	1,9	5,69	5,29	2,12	6,52	2,76	2,17
21	2,23	3,98	3,61	1,87	1,96	2,46	2,59
22	2,02	5,95	5,38	2,38	4,53	3,09	2,4
23	1,49	7,01	2,04	1	5,78	1,12	1
24	2,31	7,01	5,22	3,66	3,73	1,66	4,22
25	3,56	1,74	2,82	3,72	4,46	3,97	4,23
26	2,71	5,72	4,18	2,39	3,01	2,4	1
27	2,8	5,55	4,57	3,72	4,01	3,21	3,62
28	3	5,18	6,47	2,82	4,79	2,12	1
29	2	6,01	3,47	1,12	4,05	1	1
30	2	4,33	2,77	2,58	4,76	3,16	1,62
31	5,11	6,31	5,71	5,58	1,99	3,62	2,76
32	1,85	6,75	4,96	2,41	5,57	3,81	1,39
33	3,33	3,22	4	3,2	4,56	3,17	3,01
34	2,13	4,47	3,54	2,12	2,24	1,73	1,69
35	3,13	4,01	4	2,64	1,99	3,73	4,01
36	2,18	6,53	2,84	1,9	2,76	1,82	2,59
37	2,54	3,18	4	2,95	6,24	2,87	2,01

38	1,37	6,06	1,52	1	2,41	1	1
39	3,37	4,65	5,01	3,33	4,01	4	1
40	2,18	3,86	3,69	2,2	6,27	2,96	1
41	3,18	4,72	4,74	2,12	3,47	3,53	2,32
42	1,87	5,43	5,2	1,73	3,94	5,41	1
43	2,67	3,78	6,08	2,76	3,52	3,64	3,79
44	1,56	5,13	5,15	1,23	1,99	3,25	1
45	2,97	3,34	4,65	3,2	4,01	3,3	4,01
46	2,13	6,01	2,08	1,12	1,23	1,29	2,01
47	2,18	6,01	4,21	2,15	3,51	2,4	2,01
48	4,88	5,02	5,15	3,86	3,53	4,52	3,35
49	1	4,3	2,59	1,34	3,14	1,17	1
50	2,36	6,45	2,9	2,01	3,76	2,12	1
51	3,09	3,17	2,96	2,92	2,7	5,3	4,23
52	2,11	5,49	2,52	1,61	2,52	1,91	1,3
53	2	4,69	3,77	1,55	4,04	2,12	2,71
54	2,82	6,01	4,47	2,72	4,05	2,41	1,64
55	4,86	4,53	4,75	4,29	5,56	4,45	4,01
56	2,49	6,01	4,15	2,92	4,24	3	2,4
57	2,56	4,23	3,96	2,1	4,49	2	2,01
58	2,36	4,71	3,59	2,61	3,49	2,4	3,72
59	2,65	4,15	2,98	1,97	5,3	2,92	2,94
60	1,41	3,31	5,59	2,03	5,51	2,28	1,62
61	1,54	4,76	2,9	1,47	4,76	2,99	1
62	2,55	5,53	5,17	2,85	3,98	2,76	2,01
63	2,64	4,74	3,61	2,45	2,74	3,07	2,03
64	2,1	3,45	3	2,91	2,77	2,12	1,69
65	5,75	4,43	4,69	3,59	3,25	2,04	1
66	1,54	5,66	2,09	1,22	1,77	1,8	1,32
67	1,66	6,01	4,72	1,79	4,06	2,12	2,01
68	2	5,1	2,42	1,82	2,22	1,43	2,64
69	1,92	5,18	3,12	2,16	2,49	1,69	1
70	2,7	4,94	4,17	3,91	3,76	3,63	4,01
71	2,66	5,99	5,78	2,81	3,51	2,74	1
72	5,48	5,05	5,1	5,24	4,81	4,47	3,55
73	1,13	4,32	1,38	1,73	1,5	1	1,32
74	2,97	4,71	3,82	3,17	4,72	3,15	4,11
75	1,54	6,01	3,32	1,51	6,01	1,29	2,01
76	2,42	5,18	4,03	3,08	5,05	3	2,84
77	5,88	5,52	4,66	1,69	2,72	2,26	2,64
78	2,31	3,71	3,39	2,69	3,25	3	2,01

79	2,28	7,01	5,79	1,74	2,48	2,36	1
80	3	3,9	1,79	2	2,76	1,85	1,69
81	3,03	6,52	5,55	3,08	4,21	3,89	2,6
82	1,62	3,64	5,13	1,62	2,49	2,17	1,64
83	2,87	4,43	4	3,25	4,01	3,04	3,05
84	5	3,57	2,61	4,72	3,52	4,43	6,02
85	1,36	3,46	2,73	1,87	1,25	2,12	1,91
86	2,08	5,58	3,39	2,8	3,73	2,62	3,72
87	1	4,95	1,61	2,01	2,98	3,04	5,72
88	2	5,53	4,65	2	5,24	2,29	3,01
89	2,9	5,77	6,23	3,04	7,01	3,44	2,62
90	1,46	4,01	4	2,21	2,47	2,53	4,01
91	2,57	5,51	4,26	2,83	4,01	2,63	3,48
92	1,94	4,99	2,26	1,7	2,51	2,47	4,55
93	2,3	3,84	3,8	1,85	2,99	1,95	2,32
94	2	4,01	4	2,93	3,25	1,87	4,01
95	3,65	4,01	4	4,13	4,73	4,32	1
96	2,85	6,75	6,82	3,09	3,49	2,14	1
97	2	3,9	4,45	2,68	4,2	2,95	2,01
98	1	4,48	5,65	1,26	3,21	2,86	1
99	2,51	4,33	3,79	2,38	3,25	3,11	2,01
100	1,26	7,01	6,99	2,02	3,4	1,99	1
101	1,28	7,01	6,61	2,51	4,01	2	1
102	2,57	5,52	5,17	2,48	3,01	3,24	3,01
103	5,33	4,43	5,78	3,77	2,78	1,89	1,59
104	4	6,33	4,64	4,1	4,01	2,53	1,96
105	2,15	6,22	5,21	2,87	4,24	2,49	2,17
106	2,43	3,74	4	3,64	3,73	3,87	4,01
107	4	4,01	4	4	4,01	4	4,01
108	4,82	4,27	4,22	3,55	5	3,88	3,91
109	1,63	3,07	1,79	2,37	3,45	2	2,01
110	2,56	5,01	4,78	3,09	3,25	3,55	2,01
112	3,41	5,18	5,59	2,67	4,02	2,53	2,3
113	2,28	4,74	2,79	2,12	4,49	2,17	3,65
114	3	4,05	5	4	3,73	4,05	4,23
115	6,83	7,01	6,99	6,31	7,01	3,23	1
116	2,67	3,51	3,17	2,75	2,5	2,88	6,06
117	3,68	6,01	4,77	3,81	2,73	4,56	1,96
118	1,9	3,09	2,56	3	2	2,12	5,21
119	3,28	3,74	4	3,8	4,01	3,4	4,01
120	2,97	4,46	4,22	1,77	3,27	2,13	1

121	3	5,6	5,98	2,77	2,7	2,57	1,39
122	2	6,22	5,34	1,85	3,24	2,79	1
123	2,59	4,72	3,26	1,88	3,27	1,43	1

Table 56: Individual scores on all measured constructs

Section 4: Results to test regression analysis assumptions

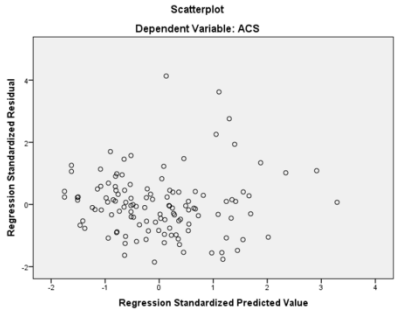


Figure 74: Scatter plot of residuals and predicted ACS value

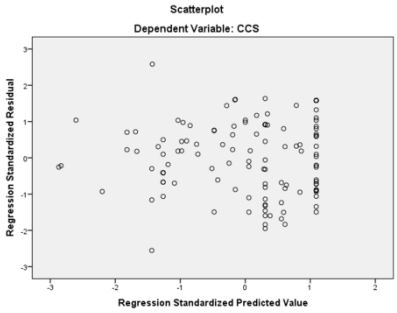


Figure 75: Scatter plot of residuals and predicted CCS value

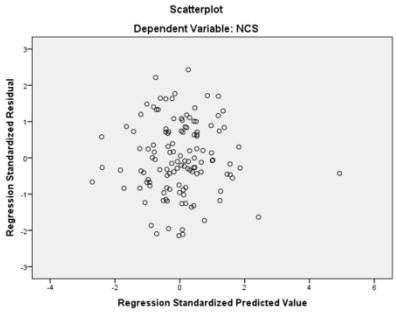


Figure 76: Scatter plot of residuals and predicted NCS value

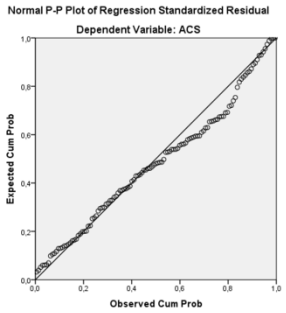


Figure 77: Normal P-P plot of ACS predicted variable

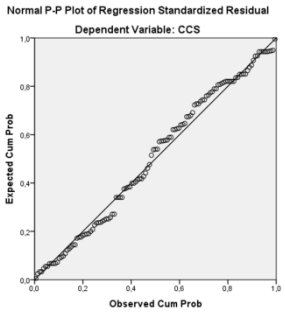


Figure 78: Normal P-P plot of CCS predicted variable

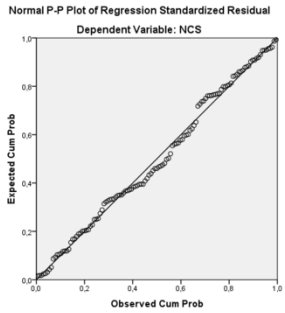


Figure 79: Normal P-P plot of NCS predicted variable

Appendix E: General

This appendix shows the introduction and reminder text as send to employees via email. In the introduction text, information about the researcher, the scientific and practical value of the research and some ethical issues are provided. At the end of this appendix a tree decision-making statistical diagram is shown.

Introduction to Survey

Dear all

My name is Leonidas and I am a graduate student in Amersfoort in the rail department. I am doing my master in Construction Management & Engineering at TUDelft. For research purposes I am conducting an online survey which I warmly ask you to fill. You only have to make some choices and click the suitable responses. No text for you to write but only clicking.

You are asked to provide your personal value to the questions. Remember there aren't correct or no-correct answers. Give your answer based on your feelings and opinions. There are 54 questions and it is estimated to take you no more than 10-15 minutes in completing.

My research examines the organizational readiness theory by exploring and conducting statistical analysis in the topics of change commitment and organizational readiness for change factors in the sense of working and designing in a more standardized process. From scientific point of view, this information can be used for further detailed theory development and potential link of organizational readiness for change theory to change management theory.

From practical point of view, information created regarding change readiness will assist the company in depicting where the organization stands at this point in time and initiate reliable and successful potential change planning. Therefore your opinion is highly valued.

This survey is fully anonymous and it is in Dutch. Researcher cannot trace email information or name. For you reference and validity you can check the link at the end of the text. Data will be used only for my graduation project, education reasons and will be kept confidential in any aspect potentially harmful to company's value. Information created by the researcher will be presented and submitted to a professor at the Delft University of Technology.

You are always welcome to ask questions regarding my research by sending an email, by visiting me at rooms C4.74/C4.78 where I usually sit or by calling me. Please do not hesitate to ask whatever makes you feel more comfortable.

Enjoy filling out the survey (click the link below to open the survey):

[Survey Link]

Note 1: Below is the link in which you can check anonymity proof. As you will see while reading the text there are two options by which someone can trace respondents but in our survey none of them is used.

http://helpcenter.typeform.com/hc/en-us/articles/204676955-How-to-identify-your-respondents

Note 2: I would like to gratefully thank Jeroen Hoekstra in translating the survey questions in Dutch. Dank je wel Jeroen.

Note 3: In case you want to change your answer before submitting you can scroll up and down to find questions you desire changing. Just click on the given response to unselect. Read carefully each statement and reply accordingly.

With kind regards

Leonidas Papadopoulos

(Mobile phone number)

Reminder

Dear All.

Some of you have already successfully completed my questionnaire survey but unfortunately some of you haven't done yet. Due to limited participants each of your reply is important. Till now I have received 72 (36%) responses out of 219. I must collect 160 due to statistical requirements.

Click the link below to start before Tuesday 18:00(deadline)

[Survey Link]

It will not take you more than 15 min to finish.

Feel free to contact me in any case.

Kind regards

Leonidas

(Mobile phone number)

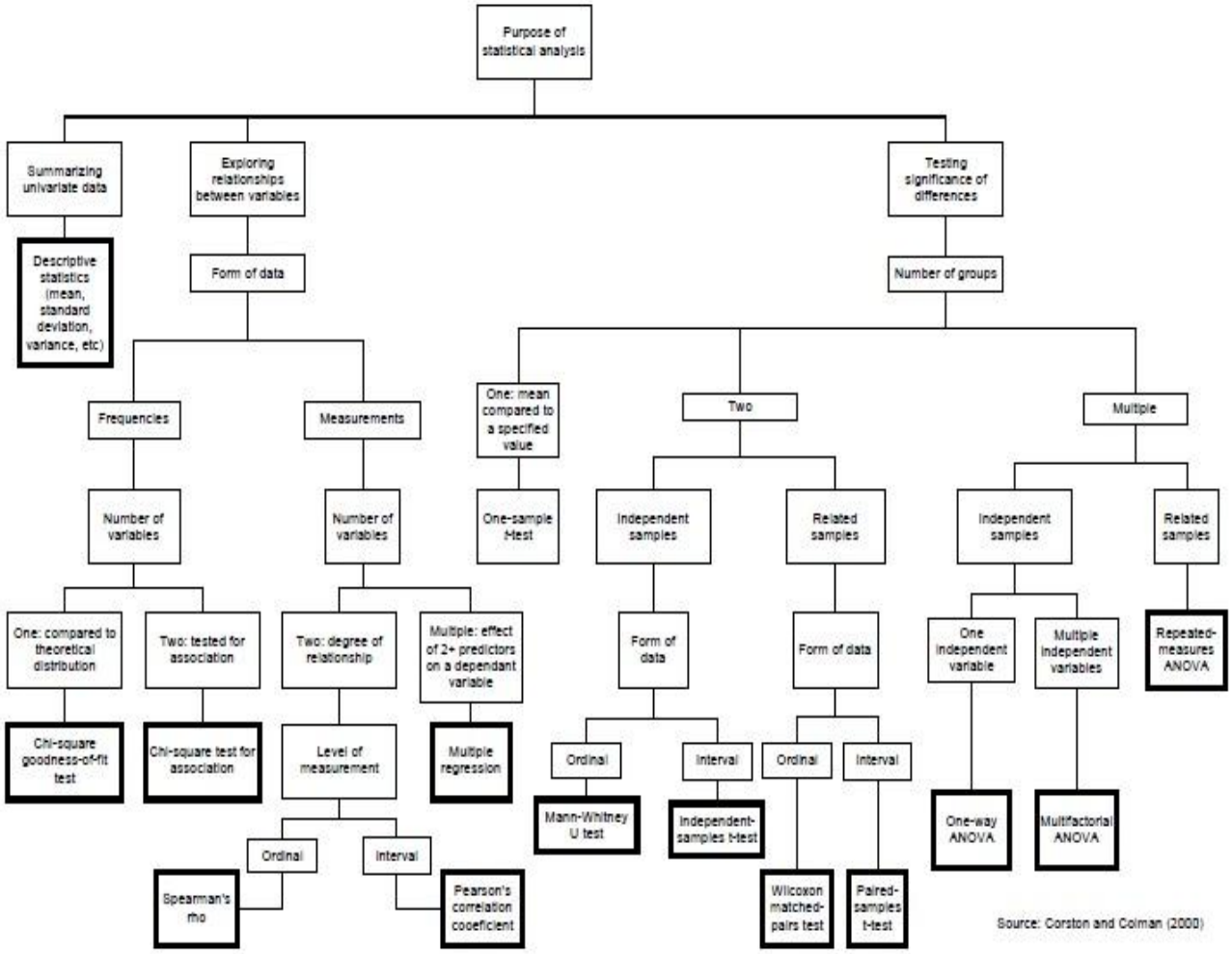


Figure 80: Decision-making Tree Diagram for Statistics