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Introduction to Change Management

Tools for change, with a case study

Metropolia

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The subject of this thesis is change management and tools relating to it. Even though the subject matter itself is timeless, recent acceleration and increased complexity of ongoing technological change have made the subject increasingly relevant. The primary goal of this thesis is to offer the reader perspectives on change management from both the individual and organizational viewpoints.

The study was based on relevant literature and a case study reviewing the application of lean-tools in HUS – The Hospital District of Helsinki and Uusimaa. The case study was based on expert interview and available reports on the organization.

For individuals, significant factors relating to change are fear of change, motivation and the will to learn more. From the organizational perspective, technological advancement creates pressure to change processes; and when processes change, people should adapt to these changing processes. Culture, collective experience, offers another layer of viewpoints on top of this. When these factors are considered, the result is an overview of change management; the future offers us both challenges and hope.

The study and application of context analysis combined with the principles of change management makes it possible to understand these challenges, as well as to react to them.

Keywords	change management, adaptability, context analysis

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Insinöörityön aiheena on muutoksenhallinta ja muutoksenhallintaan liittyvät työkalut. Vaikka aihe onkin ajaton, muutoksen viimeaikainen kiihtyminen ja monimutkaistuminen tekevät aiheesta tulevaisuudessa erityisen relevantin. Työn ensisijainen tavoite on tarjota lukijalle näkökulmia muutoksenhallintaan sekä yksilön ja organisaation perspektiivistä.

Työ perustuu aiheeseen liittyvään kirjallisuuteen sekä tapaustutkimukseen mikä käy läpi lean-työkalujen käyttöä Helsingin ja Uudenmaan sairaanhoitopiirissä. Tapaustutkimus perustuu haastatteluun sekä organisaatiosta saatavilla oleviin raportteihin.

Yksilöiden kohdalla merkittäviä muutokseen liittyviä elementtejä ovat erityisesti muutoksen pelko, motivaatio ja halu kehittyä. Organisaatioiden näkökulmasta kehittyvä teknologia luo paineen muokata prosesseja uudenlaisiksi; ja kun prosessit muuttuvat, ihmisten tulisi sopeutua näihin uusiin prosesseihin. Kulttuuri, kollektiivinen yhteisöllinen kokemus, luo tähän oman vuorovaikutuksen kerroksensa. Jos huomioidaan odotettavissa oleva teknologinen muutos, lopputuloksena saadaan kuva muutoksenhallinnasta; tulevaisuus on täynnä haasteita, mutta kuitenkin toiveikas.

Kontekstianalyysi yhdistettynä muutoksenhallinnan periaatteiden opiskeluun mahdollistaa näiden haasteiden ymmärtämisen, ja siten toivottavasti rationaalisemman reagoinnin työn alla oleviin ongelmiin.

Avainsanat	muutoksenhallinta, sopeutumiskyky, kontekstianalyysi

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Abbreviations

AI   Artificial intelligence

BSC   Balanced scorecard

CEO   Chief executive officer

ETHICS   Effective Technical and Human Implementation of Computer based System

FIMM   Institute for Molecular Medicine Finland

HUCH   Helsinki University Central Hospital

HUS   The Hospital District of Helsinki and Uusimaa

IT   Information Technology

JIT   Just-In-Time.

OEE   Overall equipment effectiveness

OSM   Office of strategy management

SWOT   Strengths, weaknesses, opportunities, threats

TPM   Total productive maintenance

1   Introduction

Our world is changing; it always has, and it always will. What is different at this moment in time, compared to the past, is the rate of change and the speed of communication. Billions of people can and do seek competitive advantage for themselves or their chosen teams, be it in business world, organizations, or in private life. Speed of communication and information gathering combined with the current rate of change creates constant opportunities for new ventures for anyone willing to rise up.

It is not far-fetched to presume that coming advances, for example, in information technology, biotechnology, nanotechnology, automation or artificial intelligence research will change several areas of the human life. One new groundbreaking innovation could theoretically marginalize entire industries, while creating new ones. For example, in a recent 2013 study it was estimated that 47% of the total US employment was in a high risk category for automation [Frey et al, 2013]. What is true for US employment, is likely to be true for the western world as a whole.

In many instances of life and business, the writing is already on the wall: adapt or else. How we as individuals and groups react to both expected and unexpected changes will define our future. Systematic study of expected change and environmental factors i.e. the context, and acquisition of change management tools will hopefully form a firm foundation from which our ability to react to the ever-changing world comes.

1.1   Objectives of the Thesis

This thesis is divided into three main parts: theory, tools and a case study on the use of lean-tools in the healthcare sector. As such, the thesis objectives can be divided into three main parts.

Theory objectives:

- Introduction to change management
- Identifying challenges in change management

Tool-related objectives:

- Introduction to indicators of change
- Identifying ways to track change success in relevant contexts
- Introduction to lean, a model of improvement
- Review of three models of change management

Case study objectives:

- Review of the use of lean in HUS – The Hospital District of Helsinki and Uusimaa
- Review of these practices from a theoretical point of view

Combined these change-related viewpoints aim to form a kit that would help us to reflect on what could be done.

1.2 Research Methods

The thesis is based on the existing literature on management, change management, strategy and psychology, as well as the current ongoing discussions and public speeches on technology and our possible futures. The case study follows the form of a descriptive case study, and is based on an interview, annual reports, assessment reports and other available data.

2   Change Management

It has been said that the driving force behind most of the changes seen in the past 200 years has been both new technologies and the energy surplus from fossil fuels [Catton, 1980; Kuusi, 1982]. The change from the early 20th century assembly lines managed with the scientific principles of Frederick Taylor, to the 21st century automated factories managed by computers, would have been hard to imagine at the time. A major change in the context of technology has been towards the so-called technological convergence where several different technologies are combined in joint function [Blackman, 1998; Roco, 2002; Bainbridge 2005].

Combination of different technologies, especially so called emerging technologies, connected with information technology (IT) have the potential to change almost any field of business, and the human life itself [Bainbridge 2005]. Emerging technologies include, for example, cognitive technologies (artificial intelligence), nanotechnology, biotechnologies, IT and advances in automation. If we presume that these emerging technologies are going to change most facets of life and business, it is not far-fetched to expect changes coming to most organizations as well. If change is paramount for the survival of the organization itself, then control of this coming change is as important.

Identifying the need for change requires a detailed understanding of the current state of the organization's operating environment and a clear picture of how things could be. Further on, a prerequisite to understanding an organization's strengths and weaknesses is the flow of internal communication, which often stands on the organization's culture and general atmosphere. Understanding the business environment and the potential for future innovation requires, again, consistent and focused individuals with regard to the activity of business intelligence acquisition. In order to make changes, the leader needs to consider a number of different factors. Organization's goals and strategy, and the objectives and strategy of external actors are parts of the operating environment. There should be indicators to monitor both the present and coming change. One should also consider the various stages of the deployment and the timing of the change, as well as their impact on the organization.

The organization's existing structure, culture and customs will make a significant change often challenging to implement. For this reason, essential is not only the change management process, but also human behavior and social change.

This chapter will go through the theory of change management from different points of view. The sections from 2.1 to 2.3 address the change management theory from individual, team and organizational perspectives. Sections 2.4 and 2.5 discuss organizational culture and technology, respectively.

2.1 Change and Individual

In his groundbreaking 1970 book, Future Shock, Alvin Toffler argued that accelerating change in technology and society causes in most of us what he coined an 'information overload', leading to stress and feeling of being overwhelmed – a future shock [Toffler 1970]. On an individual level, in our private lives, adoption of new technology is voluntary and led mainly by trends, friends and our acquaintances. But in organizations, places of work, new technologies, structures and methods of work are dictated by a need and by our leaders. A soft conflict between individuals, teams and organizations is to be expected, unless carefully managed.

Relevant questions that an employee thinks of at the beginning stages of change relate to the personal impact of change, the impact on the employee's group of friends at work, and the impact on the employee's day-to-day responsibilities [Hiatt et al. 2012]. Fear of change and the unknown, as well as concerns of personal job security usually trump everything else unless somehow alleviated. These all could be thought through Maslow's hierarchy of needs, as being unemployed is a threat to one's safety, identity and self-esteem, and losing your friends undermines one's sense of belonging [Maslow 1954]. Therefore, one aspect of early change management is alleviating the fear of change in employees.

This section aims to go through different approaches to individual change by touching four main schools of thought in psychology and therapy: psychodynamic, cognitive, behavioral and humanistic theories.

The field of psychodynamics is about understanding the changing patterns of behavior and motivations, where people are treated as individuals with their own phases of emotional states. In a way, psychodynamics studies change in personality. A central theme to study interactions between the id, superego and ego. Id describes one's instinctual impulses and patterns of behavior. Superego is one's sense of right and wrong, and internalized cultural rules; our conscience. Between the instinctual and rational is our

ego, consciousness that is aware of superego while trying to please our id, usually without realizing it. [Freud, 1923.]

For managers, understanding this division between perceived needs and internalized values can be useful when an employee is going through change [Cameron et al, 2009]. Changing emotional states have been described for example by Elisabeth Kubler-Ross in her model of five stages of grief, where a person transforms by going through:

1. Denial, where reality is denied.
2. Anger, where frustration causes a person to lash out at others.
3. Bargaining, where a person hopes to avoid change by doing something else.
4. Depression, where grief causes immobility.
5. Acceptance, accepting what is and going along with it. [Kübler-Ross, 1969.]

Then again, rather than a model of expected emotions, it could be seen as a reminder of different possible reactions to change [Cameron et al, 2009]. All in all, a central theme in most psychodynamic therapy and theories is resolving a person's inner tension and conflicts. In organizational change, managing just that could be considered one of the first steps.

2.1.1   Motivation and Meaning

A manager can somewhat easily track an employee's work performance, but it is hard to keep track of an employee's motivation, as motivation is an inner state of a person. Nonetheless, as motivation creates a will to exceed oneself, and can help create something new, management of employee motivation, especially during change, is one of the critical aspects of employee management.

Before we go through creation and upkeep of motivation, it is important to remember that the easiest way to have highly motivated employee is by hiring one that are already motivated. Of course, it is easier said than done, as assessment of one's personality during the hiring process can be challenging. But there are some ways, for example evaluation of general positivity, attitude towards failures, or what the prospective employee seems to be passionate about.

In psychology, the cognitive theory studies mental processes, such as motivation, thinking and creativity, while cognitive therapy tries to modify said processes [American Psychological Association, 2016]. The cognitive approach to change management links goals to motivation, by positive reframing of change and needed work [Cameron et al, 2009]. And again, the so-called goal-setting theory rests on the idea that a purpose can cause an action [Locke 1968]. The purpose of actions and goals could be seen as one of the traits that defines us as persons, i.e. motivation is an important character defining trait, as it causes a will to action, which in turn leads to action.

Creating motivation in a person requires an understanding of the different sources of motivation. Possible sources of motivation can be thought of by going through a person's relations to different aspects of the workplace:

- One's relation to the job itself: Motivation comes from enjoyment of job, bettering oneself, achieving goals and/or thriving at what one does. This could also be seen as one requirement for a true flow state, i.e. complete immersion and focus on what one is doing. [Giancola, 2010.]
- One's relation to self (me): Motivation can come from the money gained, personal power at the workplace, status among peers and society, or affiliation to others with access to wanted symbols of success. [Sturman et al, 2011.]
- One's relation to team: Maybe motivation comes from friends and inclusion in the workplace. A stable peer group can be a source of comfort and validation, almost a source of meaning. [Nohria et al, 2008.]
- One's relation to the customer: Motivation comes from a desire to help others, coworkers, the manager or the customer. 'Let's make it happen together' -attitude and uplifting others is one's driving force and source of motivation. [Sturman et al, 2011.]
- One's relation to the company, the company being number one: Pride of one's place of work can be a powerful source of motivation, and especially important because pride can be created through organizational vision and objectives, understanding of the importance of one's work, or, for example, by employee involvement in company decisions. [Katzenbach et al, 2011]
- One's relation to society through a company: Corporate social responsibility is an idea in ethics, integrated into a business model, if agreed upon, that commits the company to behave ethically towards society at large. This, again, can be a source of motivation to employees. [Gond et al, 2010; Sturman et al, 2011.]

Of course, usually motivation comes from a mix of several aspects of work. When addressing reasons for change, or for upkeep of general motivation, the manager may want to dip into most of these categories.

Most of the abovementioned sources of motivation can create a so-called intrinsic motivation, internal motivation, that is rewarding in itself. The self-determination theory, a macro theory in cognitive psychology, describes how intrinsic motivation comes from innate needs of:

- Competence, need to experience mastery and control outcomes. Enforced with positive feedback.
- Relatedness, need to interact with others and experience caring for them.
- Autonomy, freedom in one's actions [Deci et al, 2004].

This intrinsic motivation is closely related to personal mastery discussed in section 2.1.3.

2.1.2 Pressure Towards Adaptability

The continually changing world of work has created a need for employees with cross-disciplinary knowledge, where bits and pieces of details come and go. Adaptability, the ability to change when needed in order to fit in to a new environment, seems to be a major competitive advantage for both an individual and for a whole organization. From the organizational point of view, people work in processes, and when processes change, people need to change. Organizational capability and readiness to adapt can be thought to come both from having enough individuals with good adaptability, and from organizational structures towards easier change.

Emotional intelligence has been identified as one predictor of a person's career adaptability (in addition to life satisfaction and positive interactions with others) [Coetzee et al, 2014]. Emotional intelligence has been defined as the ability to understand yourself (self-awareness) and your thoughts (self-regulation and motivation), as well as others and their feelings (empathy) [Lal et al, 2015]. Development of emotional intelligence happens through the environment of teamwork and co-operation, in other words, through social interaction [Lal et al, 2015].

The behaviorist theory has assumed that behavior comes from external stimuli, or from a person's previous history. This includes encouragement or discouragement, reward or punishment, by others. Using the behavioral approach to change management could be seen as a possible way to encourage adaptation [Cameron et al, 2009]. But as the needed skillsets of employees rise to be more and more complex, effectiveness of external motivation should be questioned. One exception to this seems to be encouragement. In a 1994 study of schoolchildren [Ryan et al, 1994], it was found that if children felt secure and cared for by their elder, they would integrate extrinsic regulations, be more motivated, and have better self-esteem, and vice versa. Correlations with the work environment should be noticeable.

2.1.3   Personal Development

In his 1990 book, The Fifth Discipline, Peter Senge identified individuals who learn as a requirement to organizational advancement. Senge coined the term 'learning organizations' as a description of group of people who strive to continually better themselves, in order to achieve their defined goals [Senge, 1990]. In his work, discipline of personal mastery is about:

- Living in a continual learning mode, seeing 'life as a journey' and 'journey as the reward'.
- Mastery as a 'process', instead of something one 'possesses'.
- Being aware of one's ignorance and incompetence, and possible areas of growth.
- Continual clarification of what is important to us, having a vision on how 'things ought to be'.
- Continually trying to gain a better understanding of the current reality.
- Capacity for delayed gratification, making possible to achieve objectives others would disregard.

Senge described people who have this attitude towards life as usually being deeply self-confident, self-reflective and inquisitive. Motivation and meaning come from within. Adaptability and fear of change don't even come into play, as one's life is about continual change. [Senge, 1990.] If we presume, that Senge described the personality that many organizations of future need, how do we achieve this in individuals and teams? Section 2.4.2 approaches this question from another perspective.

In psychology, the humanistic approach has been about personal growth, healthy relationships and reaching the human potential [Cameron et al, 2009]. The human potential movement from 1960's counterculture-days helped to create the humanistic management theory which rose in 1980's as a response to the scientific management theories of the early 20th century. Human needs and values were seen as the primary goal. While Senge described the type of person organizations need to continually evolve and grow, he also wondered if large-scale human transformation can ever truly happen, and from the organizational perspective, is it even preferable? For example, empowering people who do not share organizational vision and mental models about business reality can instead use personal mastery to pursuit their own personal visions, causing organizational stress and burden on management [Senge, 1990]. These are relevant questions in per organization basis.

But if we presume that personal mastery is relevant to an organization in question, how to encourage employee in embracing it? How to encourage personal development? How to identify it when hiring a new employee?

In his 2013 book Mastery, Robert Greene studied both historical and contemporary masters of their respective fields, and identified a mentor-apprentice relationship, first as an apprentice and later as a mentor, as one common trait of people who have reached mastery [Greene, 2013]. Coaching for performance should be separated from coaching for personal development, as most mentoring in organizations usually aims for relevant skill acquisition for needed tasks, instead of realizing individual potential for innovation or creating something new. If we presume lifelong mentor-apprentice relationships to be almost a requirement for achieving one's vision, we could ask if the same also applies on organizational level, as a shared vision is one requirement for a learning organization according to Senge [Senge, 1990].

2.2   Change and Teams

What makes teams important? What is a team? Answering these questions is essential, in order to understand the importance of change management at team level. A team could be defined as an interdependent group of people restricted in size, with a defined goal and reason of being. It has common objectives, shared and individual responsibilities, and members of this team interact with each other [Cameron et al, 2009]. In other words, a team does something that is too large in scope or in complexity for

one person to manage. Because a team may be pursuing more than its parts can individually achieve, the expected value of change management at team level can be larger than at individual level, per individual at team; more complex the task, more valuable change management becomes.

The role of an individual in a team is defined partly by one's responsibilities in a team, and partly by interpersonal relationships. Group dynamics, a term coined by Kurt Lewin in 1940's [Lewin 1947], describes how groups and individuals act and react to change. According to group dynamics, the nature of the group combined with different personalities defines the individuals' social identity in that group, which in turn affects behavior. Also, at the same time person wants to both be like others and be included in a group, while also retaining individuality compared to others (so called optimal distinctiveness theory proposed by Marilynn B. Brewer [Brewer 1991]). From these aspects of behavior and group dynamics emerges whole-group cohesion (section 2.2.1).

Leadership is one critical aspect of management, as complex interpersonal relationships in an organization create social structures that can have an unexpected effect on change. In addition to formal functions required by the job, social groups form around the personal interests of different kinds of people. Some rise up to be social leaders, whereas some gather and share informal information unrelated to what the team should be doing. Recognizing the informal roles of different people helps the manager at his leadership role during change (section 2.2.2).

2.2.1   Team Effectiveness During Change

In section 2.1.1 we touched the idea of the team as a source for motivation. This interpersonal motivator stems partly from individual relationships, and partly from group cohesion. Cohesion as a concept is important when considering how to improve group effectiveness. On the surface, cohesion could be thought to be 'sameness', where individuals are like each other. But a more correct definition would be a bond between people in a group, where the bond arises from interpersonal relations, task relations, a perceived unity, and emotions [Forsyth 2013]. Strong cohesion, i.e. a bond between people, is important because it in turn leads to better employee participation and retention.

Differentiation between 'sameness' and more complex definition is in order, because sameness is an easy way to create cohesion. But globalization and ever more complex

requirements of work have created a need for diverse teams, where being different from each other is an advantage. It could almost be thought of as sameness in spirit, but not in thought.

The team defining characteristics that affect the effectiveness of the team in question can be divided into a few different categories [Cameron et al, 2009]:

- Team mission and goal setting, from where comes the sense of purpose.
- Team roles and responsibilities, and how different roles link to each other to achieve the team mission.
- Team operating processes and 'ground rules', problem solving, conflict management and how issues are handled.
- Team interpersonal relationships and communication, from which comes trust and a positive atmosphere.
- Inter-team relations, communication between teams so that a larger group objective stays in sight.

From these team defining characteristics we can deduce a few normal scenarios of change in a team:

- Formation of the said team, change in the team mission.
- Changes in roles and responsibilities.
- Changes in processes.
- Conflicts, changes in interpersonal relationships and communication.
- Persons leaving or joining the team.

These different causes of change can in turn be viewed through Bruce Tuckman's Stages-model of team development [Tuckman 1965]:

1. Forming, where team is established. Its leader, roles, tasks, goals and processes are defined.
2. Storming, where conflicts from the forming-stage arise, and reveal underlying problems.
3. Norming, where team members agree towards conflict resolution through communication.

4. Performing, where problems are solved and a new team settles at work, focused on task.

In a way, Tuckman's Stages-model is about pursue of cohesion, and therefore team effectiveness. With these points of thought in mind we can try to assess current team effectiveness by using appropriate tools (Chapter 3).

2.2.2 Change and Team Leadership

According to John Kotter, there is a clear difference between change management and change leadership, leadership being the foundation of successful change [Kotter, 2016].

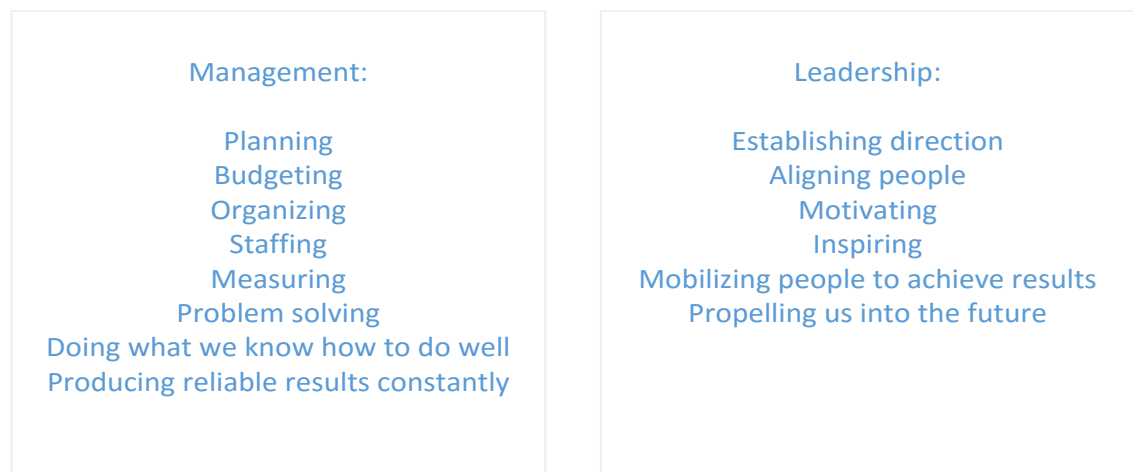| Management:	Leadership:
Planning	Establishing direction
Budgeting	Aligning people
Organizing	Motivating
Staffing	Inspiring
Measuring	Mobilizing people to achieve results
Problem solving	Propelling us into the future
Doing what we know how to do well	
Producing reliable results constantly	

Figure 1. Management vs leadership differentiation [adapted from Kotter, 2016].

These attributes of successful leadership seem to align with one of Peter Senge's disciplines: shared vision, a collective picture of future that we seek to create. This shared vision, i.e. shared meaning, is the collective sense of what is essential, and why it is essential [Senge, 1990; Senge et al, 1994]. If we see the organization, or parts of the organization, as a community of likeminded people with a shared vision, change leadership could come almost naturally, as a part of day-to-day routines. But installing one clearly defined vision into all members of an organizational community is challenging, as it is about accepting someone else's aspirations of future as one's own. Different starting points for creating a shared vision can be found in these five stages [Senge et al, 1994]:

1. Telling, where the management dictates what the vision is, and the organization has to follow it.

   Limits: Poor commitment that can be mistaken as a problem of communication.

2. Selling, where the management dictates what the vision is, but needs the organization to "buy into it."

   Limits: As management is still seeking just compliance, employees will comply, but not truly commit.

3. Testing, where the management has an idea of what the vision should be, but wants to see the organization's reactions to it, before proceeding.

   Limits: Rests on people's ability to understand current reality.

4. Consulting, the management has a vision, and wants input from the organization before proceeding.

   Limits: Limited by the assumption that organizational vision is still created from top to down, whereas important elements of it are still put into practice on a local lower-level.

5. Co-creating, the management and members of the organization build a shared vision. Teams express their common purpose, seeking alignment if not agreement.

A shared vision seems to be one strong method of creating alignment, commitment and sense of purpose, and from that possibly an easier change. Section 3.3 reviews some models of change management from the perspective of team leadership.

2.3   Change and Organizations

Change at organizational level can mean several different things. It could mean change in vision or strategy, creating a new team or layoffs in existing ones, adopting new technologies, mergers, etc. What is common between all of these possible changes, is the managerial choice that is based on perceived current and expected reality. Change without firm understanding of why to change is easily wasted; i.e. reaching one's goal can be difficult without assessment of current position. Overview of some tools and models for analyzing current context can be found in section 3.1.

Organizations must have a reason to exist, i.e. answer for question 'why to exist?'. To fulfill that reason, is the strategy, i.e. 'concept and idea of how to fulfill the reason to exist', and hopefully means, i.e. 'how to physically achieve our reason to exist'. In order to

analyze change at organizational level, all three points of view should be considered relevant.

The mission statement and vision are the usual means of communicating the organization's reason to exist. In organizational theory, the postmodernist perspective of vision-building rests on the idea that organizations live in and speak for multiple different realities. On the other hand, the realist perspective seeks to counter the postmodernist idea of multiple realities, while accepting the idea that reality is socially constructed. And both of these perspectives try to reject the modernist worldview of rationality, objectivity and science [Burnes, 2009]. What makes these concepts relevant, is that organizations operational environment has different kinds of people in it, and organizational vision is a means of communicating ideas to these diverse groups of people (more in section 2.4.2, the Ladder of Inference model.) When considering organizational change, vision both defines the framework for the said change and affects the mental models of people in the organization.

The concept of business strategy seems to be somewhat abstract and hard to define. Henry Mintzberg has identified five definitions of strategy [Burnes, 2009].

- Plan, where strategy is a preplanned and selected course of action.
- Ploy, where strategy is a method of outmaneuvering an opponent.
- Pattern, observation after the fact, that the organization has had a certain pattern of behavior, i.e. a strategy.
- Position, the organization seeks to align itself so that the competition against it is minimized.
- Perspective, where the people in the organization share a common idea of what is to be done, even if it hasn't been clearly defined.

From these different definitions of strategy, we find several points of variance when considering organizational change, as strategy affects the change. The idea of how to use organizations resources can be either limiting or empowering factor in change.

2.3.1   Function Defines Form

The organizational vision, strategy and the means of operation create the organizational structure. In this context, the organizational structure means the alignment of

strategy with the structure, processes, rewards and the people, as defined by Jay Galbraith [Galbraith, 2014]. His socalled Star Model pictures a framework for organizational design.
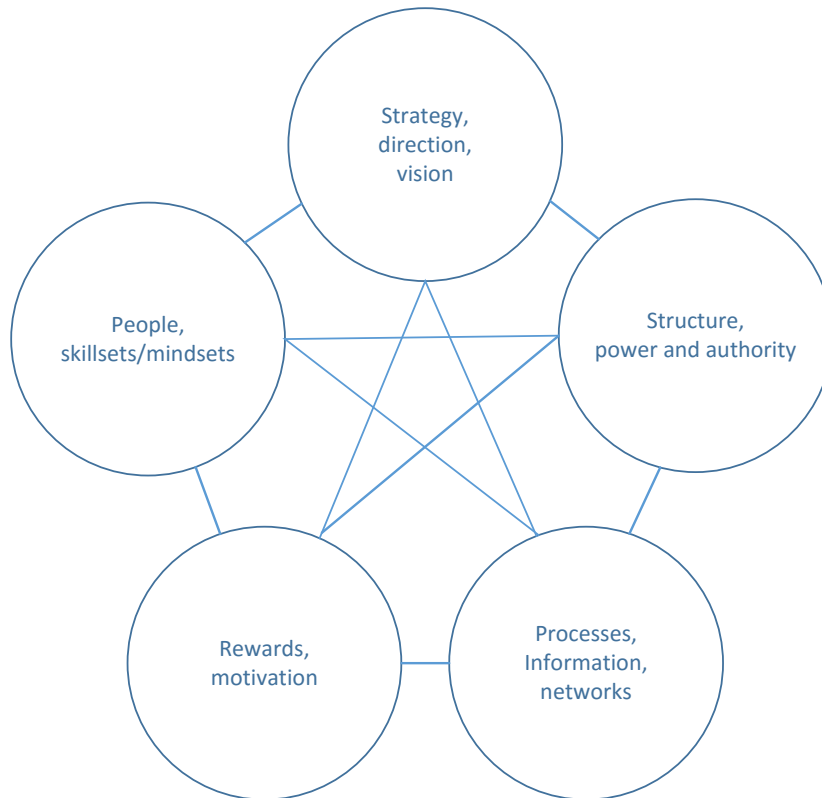

Figure 2. Star Model [adapted from Galbraith, 2014].

In Galbraith's model there are five relevant design choices:

- Strategy, the organization's roadmap for future.
- Structure, defines placement of power and authority in relation to people.
- Processes, information flow and contacts between people.
- Rewards, used to align employee goals with organizational goals.
- People, human resource policies, right people for the right jobs.

Implications of this model are that different strategies lead to different organizational structures, and for that to be effective, all policies must align [Galbraith, 2014]. From the change management point of view, this means that a change in strategy leads to a change in the organizational design; or, a change in one area of the organizational design leads to changes in other areas in order for them to be aligned.

2.3.2   Change and Processes

On a general level, a process has been defined as a sequence of actions, each requiring an input that leads to a result, an output. In Jay Galbraith's star model processes were defined as information and decisions flows, and networks and contacts between people. Galbraith differentiated processes into two separate categories, vertical and horizontal processes [Galbraith, 2014]:

- Vertical, used to centrally allocate funds, resources and people in order to minimize costs and maximize preferred output on organizational level.
- Horizontal or lateral, used to manage day-to-day workflow and teamwork, or describes organic networks between people.

As discussed in section 2.3.1, change in some fundamental aspect of organization can lead to change in other parts. Of these aspects, processes i.e. information flows, are one of the most frequently changed, because of continually evolving technology. From there, change in processes can lead to change in organizational structures, as some parts of it are no longer needed. And again, change in structures can lead to changes in people side of organization, etc.

These viewpoints of processes were also laid out after World War II by the Tavistock Institute of Human Relations in London, in their model of sociotechnical systems that was later developed into ETHICS model (Effective Technical and Human Implementation of Computer based System) by Enid Mumford [The Tavistock Institute, 1941; Leitch et al, 2010]. Both approaches tried to solve the problem in implementation of technology, be it physical or social technology, into existing processes. The problem in question was that optimization of certain aspect of whole system tends to lead into problems in other aspects of said system, e.g. technology simplifies a task, leading to a lesser autonomy for the employee, that leads to work being boring, and that in turn leads to fall in productivity. Problems like these are usually emergent, i.e. hard to predict. This problem and its emergent nature leads to a requirement of joint optimization, where the social and technical systems are designed hand-in-hand, having positive physical and social outcomes. The central principles of this joint optimization are [Maio, 2014]:

- Responsible autonomy, i.e. teams are semi-autonomous in decision making, while being responsible for the outcomes.
- Adaptability, team being semi-autonomous, it can adjust processes in order to increase sociotechnical optimization.
- Meaningfulness of tasks, above mentioned variety combined with 'whole tasks' where small team experiences the entire operation from start to finish, leading to a feeling of closure.
- Feedback loops, organizational evolution through feedback and iteration.
- Recursive interactions, verbal interactions that create and maintain individual and mutual awareness [Carvalho, 2006].
- Principle of minimal critical specification, verbatim: "While it may be necessary to be quite precise about what has to be done, it is rarely necessary to be precise about how it is done" [Cherns, 1976].

These aspects of joint optimization combined could help to create a continuous feeling of novelty, where integration of new technologies does not have such a negative effect on the efficient flow of work; the feeling of novelty and autonomy make work enjoyable.

2.3.3 Organizational Adaptability

Organizational design and alignment help to create the framework in which organization has the ability, resilience, to respond to external and internal threats and opportunities. Organizational adaptability comes from analyzing the operational environment, following trends and doing organizational assessments (more in section 3.1.1), having flexible processes and structures, and drafting plans for possible emerging issues. From this comes adaptability, and the possibility to react with emergent change, which is the idea of continuous and unpredictable process of aligning and realigning the organization in order to react to ever changing business environment [Burnes, 2009].

Organizational knowledge management, or organizational learning, is the basis for both to help to evolve the core competence of the organization, and to help to analyze the context of business environment for improved adaptability. One possible knowledge management practice is the creation of a learning organization, mentioned in section 2.1.3 [Senge, 1990]. In his model, learning organization has five distinct characteristics:

- Systems thinking, method of thinking where observed entity is viewed as a sum of interrelated parts that affect each other.
- Personal mastery, individual commitment to learning and personal development.
- Mental models, evaluation of current values and assumptions that individuals hold of organization and shared mission. More in section 2.4.2.
- Shared vision, alignment of sense of purpose in organization.
- Team learning, alignment of team as a whole, in order to focus combined team intelligence towards shared task. Collective discipline for coordinated innovation.

When developed far enough, these combined create the basis for more efficient organizational change, as the ability to adapt is ingrained into people and organization itself.

A need for flexibility in processes and structures is dependent on strategy as mentioned in section 2.3.1.

2.4   Cultural Change

Organizational culture has been defined as a collection of shared values and behaviors that create the social and psychological environment [Burnes, 2009]. From this definition, we can see that organizational culture forms from thoughts and actions of individuals and teams of individuals. It determines how things are done. As organizational culture is a description of thoughts and actions in it, it basically describes the idea how to be successful in said organization [Cameron et al, 2009].

How things are done affects productivity. Thoughts and actions of individuals affect productivity, not only in themselves but also in others. From these ideas we can see, that organizational culture can have huge impact on reaching desired objectives, therefore change in organizational culture can affect said objectives. But what is a good culture, or what is a detrimental culture? If all organizational objectives have been achieved time and again, but the culture seems unhealthy, does it matter? Answering these questions is out of the scope of this work, but they do point out something: as defining good culture can be hard, changing organizational culture usually starts as a reaction to an existing problem.

In smaller organizations change can by happen almost by itself, for example when a new employee has been hired. New ideas and ways of thought can affect the whole organization when the said organization is just a small team of people. This can be seen in startups, in emerging fast-growing businesses, where CEO may be just a coder with some extra responsibilities. Organizational culture was defined by founders and early hires, and by ensuing growth and change itself. But when said business grows, its structures change and new employees are hired, there may come a day when said CEO doesn't have much contact to 'factory floor' day-to-day operations of organization. At that point continual assessment of organizations atmosphere and culture may be needed.

2.4.1   Ways to Assess Organizational Culture

Before taking action for change, there should be an assessment of current situation. In order to get a clear picture of organizational culture, we should first try to understand its different aspects. The Culture Web, a framework developed by Gerry Johnson and Kevan Scholes, tries to describe just that [Johnson et al, 2011].

Culture web -model describes organizational culture from these points of view:

1. Stories. Conversations that deal with successes and failures, people's and leaders reputations and core beliefs. Stories tell what is considered important.
    Of importance: Identifying core beliefs and common norms.
2. Routines. Day-to-day behaviors that are expressed in addition to job itself.
    Of importance: Identify routines and rituals that are encouraged.
3. Symbols. Status symbols and company jargon.
    Of importance: Identify objects, events and persons that are revered by most people.
4. Power structures. Who has real power? What leadership beliefs.
    Of importance: Identify persons who stop or cause things to happen.
5. Controls. How people are monitored or rewarded.
    Of importance: Identify rewards and punishments, as well as ways of measuring progress.
6. Organizational structures. Flat or hierarchical structure? Are structures for team work or competition?
    Of importance: Organizational structures define relationships.

7. The Paradigm. Summary of observed behaviors in other elements of culture web, so called 'collective experience'. [Johnson et al, 2011.]
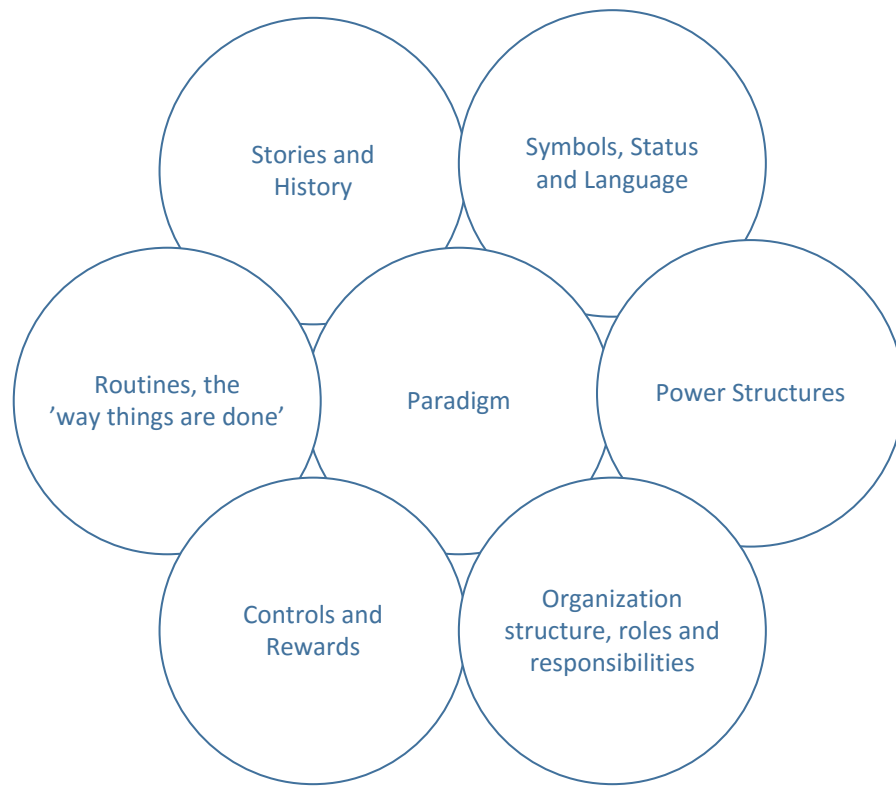

Figure 3. Culture web [adapted from Johnson et al, 2011].

All these behavioral, physical and symbolic viewpoints combined help leadership to ask relevant questions on the nature of organizations culture.

As said earlier, organizational culture is the thoughts and actions of people in it, a collective mindset. In a way, to change culture is to change people in it. It all comes back to motivation and personal development.

2.4.2   Change from Within

In their 2008 book Tribal Leadership, authors Dave Logan, John King and Halee Fischer-Wright identified five different stages of tribal corporate culture, and ways to facilitate a move to next stage [Logan et al, 2008]. These stages present different attitudes towards life, in both individuals and groups. Stages in order are:

1. Life sucks. 2 percent of the population. Stage of hopelessness with no way out. Rare in organizations but normal in gangs and prisons, as these persons tend to be hostile toward others.

2. My life sucks. 25 percent of the population. Persons and tribes with negative bitter attitudes, but with a realization that there could be a way out. Usually resistant to being led, have resistance towards change, with learned helplessness, and antagonistic personalities.

3. I am great (but you are not). 49 percent of the population. Tries to gain advantage over others and has a need to be better than others. Sees coworkers as rivals.

4. We are great (but they are not). 22 percent of the population. Tribe members have a set of shared values and goals. The tribe cooperates. High creativity and productivity.

5. Life is great. 2 percent of the population. Our values and goals define us. The tribe has a common higher cause, with a focus on the big picture and making history.

These key-words, 'we are great' etc. are something that individuals and groups usually express in their interaction and speech, one way or another. Taking note of these general attitudes and considering organizational objectives, managers can use it as a tool to gauge the order of magnitude of needed change. If some stage is found to be dominant in a group, managers may want to nudge people towards the next stage by 'showing glimpses of it', as change in one's attitude towards life is hard to change outright, but still possible if persons are receptive enough.

What if the organization does not have a healthy culture, or it does not align with the organizational objectives? Changing behavior is hard. Changing behavior without clear indicators of change is even harder, i.e. cultural progress should be measured. Jon Katzenbach has identified four different key metrics to measure when changing organizational culture [Katzenbach et al, 2012]:

- Business performance. Standard performance indicators, business growth, customer satisfaction etc.
- Milestones. Has the organization reached previous change milestones?
- Critical behaviors. Are employees doing tasks that have a non-direct effect on the goals, for example gathering business information?

- Underlying beliefs, feelings and mind-sets. How are group thoughts changing in employee surveys?

Following business performance and milestones is a routine part of operations, and non-direct work is usually noticed.

Of these metrics, general behaviors and attitudes towards life and other people rest on our mental models; often unchallenged images, assumptions and stories which create our worldview [Senge, 1990]. These differing mental models explain why two people can have the same information, and come to different conclusions based on that information [Senge et al, 1994]. So called Ladder of Inference describes this process, where our experience is based on reality and facts, but our existing assumptions, beliefs and interpretations distort the end result creating a cycle of successive incorrect worldviews.
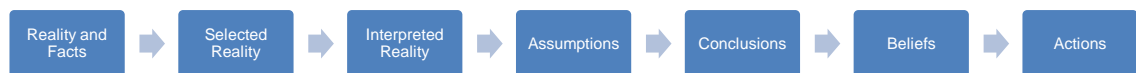

Figure 4. Ladder of Inference [adapted from Argyris, 1990]

In short, we select data from what we observe, then we add personal and cultural meaning to that data, we make assumptions based on that view of reality, and from there comes our conclusions, beliefs and actions [Argyris, 1990]. We assume that the data we select is the real data, and we assume that our beliefs are based on that supposedly real data. We assume that the truth is obvious, and our beliefs are the truth [Senge et al, 1994]. As said earlier, changing organizational culture is about changing people in that organization. If we reflect cultural behavior through Ladder of Inference, it seems that there are several possible points of contact, where change on our mental models can happen on both group and individual level, for better or worse.

Concepts and models mentioned on this section could be seen as rough pointers, for us to be more aware of people's general attitudes towards life, and flaws in our thinking, as they both have a major impact on organizational culture; external change often requires change within, and vice versa.

2.5   Innovation and Technology

As most major changes of the past 200 years have come via new technologies, be it social or physical, it would seem appropriate to examine both the nature of innovation and technology, and some current ongoing trends in technology.

2.5.1   Technology as a Facilitator of Change

Technology both makes change easier, and also in itself causes change. Consider hotel jobs being in danger because of Airbnb, or Google's self-driving cars threatening one of the biggest employers in western world, trucking industry. Online marketing, from Google AdWords to search engine optimization, and to social media marketing in Youtube, Twitter, LinkedIn or Facebook, has become more relevant than more traditional ways of finding customers. Improving communication methods, i.e. evolving processes, combined with technological convergence, i.e. innovation in technology, continually creates new possibilities for change, both in business and in private life.

Industrialization itself began with a change in energy technologies, which led to changes in transportation and agriculture [Catton, 1980]. Advances in industrial machinery lead to a new division of labor, factory system and from there came Taylor's principles of scientific management. The timeline of industrialization is almost the same as the timeline of technology.

Technology increases efficiency and productivity. For example, information technology makes communication easier, and enables creation of platforms like Uber, where the capacity of mundane commodity or process is amplified so much, that conventional ways of doing business are getting outdated. Automation in turn could replace an imperfect human with a machine that doesn't make mistakes or require breaks. Possible future innovations in biotechnology could affect the people side of societies and organizations by extending productive parts of our lives. Or let us consider nanotechnology, that could impact material sciences, manufacturing, energy production and storing, or, for example, medicine. Change is to be expected.

Dotcom boom, a speculative bubble, in the late 1990's was an early aspect of this expected change, as investors threw money into anything that even remotely seemed like a decent idea. From that 'learning experience' rose most of today's major internet companies. Currently a similar speculative boom can almost be seen in biotechnology, as

the NASDAQ biotech index has tripled in value in the past five years (from September 2011 to September 2016). Then again, current research in emerging technologies, including biotech, has primarily been facilitated by earlier advances in information technology, i.e. growth in most emerging technologies became possible via information technology [Huston, 2013], and as such, the boom does not necessarily equate bubble.

2.5.2 Innovation Strategy

The subset of strategy in general, innovation strategy aims to align parts of organizational behavior and resources with shared competitive goals in order to create something new [Pisano, 2015]. According to Pisano, relevant points in formulating this strategy are:

- Understand needs. How possible innovations create value for the customer and organization.
- Resource allocation, i.e. how to apply research strategy.
- Managing trade-offs in resource allocation.
- Innovation strategy has to evolve, keep it aligned with the strategy in general, and in line with organizational learning.

Of different major management paradigms, innovation is the most recent [Putkiranta, 2011; Kuula et al, 2012]. For how long this current pace of technological change can be maintained remains to be seen, but considering the potential impact of some emerging technologies, the relevance of innovation paradigm and innovation strategy in management is likely to remain.

2.5.3 Some Ongoing Trends in Technology

As discussed at the beginning of this chapter, most current trends in technology have been facilitated by earlier advances in information technology. Therefore, it could be expected that coming advances in IT will lead to bigger leaps in other areas as well. As such, it should be noted that IT is relevant regardless of context in general. This tendency can be seen in figure 5.
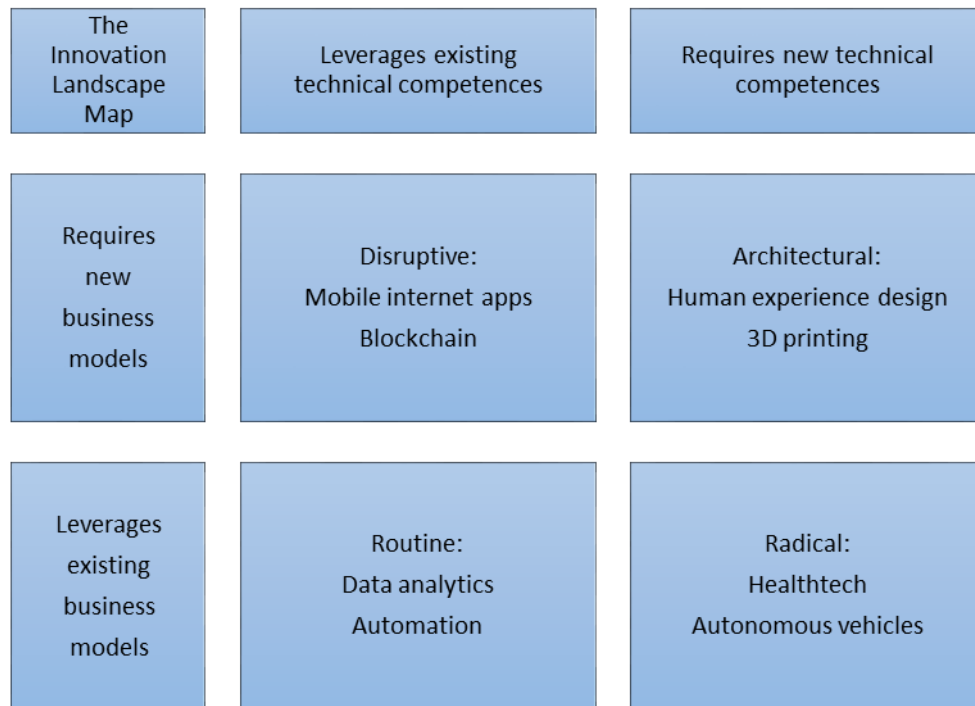
The Innovation Landscape Map	Leverages existing technical competences	Requires new technical competences
Requires new business models	Disruptive: Mobile internet apps Blockchain	Architectural: Human experience design 3D printing
Leverages existing business models	Routine: Data analytics Automation	Radical: Healthtech Autonomous vehicles

Figure 5. The Innovation Landscape Map [adapted from Pisano, 2015].

Data analytics

Data analytics refers to the use of advanced analytics methods in research and business, in order to gain better understanding of observed phenomenon, i.e. data analytics is about transformation of data to knowledge. The so called 'big data' in turn refers to volume, variety and velocity of this data, that because of its properties cannot be analyzed with traditional software tools [Laney, 2001].

Machine learning plays a big part in this, as it can automate the building of analytical models. These models are then used to monitor processes in question and gather more data, that can be again used to improve the models.

As almost anything numbers and data related can be automated, with time it should lead to automation of basic knowledge work. According to McKinsey Global Institute this could offer the output of 110-140 million workers by 2025 [McKinsey, 2013].

Data analytics has several possible applications, such as:

- Recommendation engines.

- Targeted advertising.
- Image and speech recognition.
- Logistics.
- Automated transportation and robots. As automated movement outside of controlled setting depends on responding to changes in the immediate environment, autonomous car and robot depend on the machine learning.

Despite advances in this field, true machine cognition, strong AI, still seems to be decades away in the future [Wolfram, 2016].

Blockchain

Blockchain, a technology originally developed for cryptocurrency Bitcoin, is a public distributed encrypted database. Data is gathered in 'blocks' and chained to each other with cryptographic signatures. This allows blockchains to be used as ledgers, that can be shared and modified, if one has permissions to do so. These transactions can have rules in them, in contrast with traditional databases where rules are usually set on database itself. This makes secure transfer of trust, and therefore assets, possible in the file; block of blockchain is the asset itself. Blockchain as well has several applications, such as:

- Smart contracts.
- Secure transfer of money and other financial assets.
- Secure transfer of votes and identity.
- Secure transfer of art and intellectual property.

An example of this is the Hyperledger project by The Linux Foundation, which is in a small-scale testing for business use by the IBM. [Hyperledger Project, 2016.]

Health technology

The biggest value in healthcare comes from the extension and enhancement of life, from continued ability to function. Increased speed and precision in diagnosis combined with new medicines are the standard routes for new healthcare technologies.

Some examples of emerging fields in healthtech, and possible applications in them include the following:

- Wearable devices, e.g. fitness tracker or smart watch, combine healthcare and big data. Device gathers data that can be used to track current condition of user.
- Data analytics. As said earlier, knowledge from data.
- Synthetic biology. Synthetic life.
- Genomics and genomic medicine. When combined with synthetic biology leads to bioengineering.
- Systems biology. Use of machine learning on how biology works. Applications on all aspects of medicine.

A common aspect in all of these is IT, and past and expected advances in machine learning.

<u>Advanced materials</u>

Exciting from an engineering perspective, new materials with new properties can offer applications that were earlier impossible. Some examples of fields of material research include the following:

- Nanomaterials, materials microscopic in size, applications in diagnostics for medicine, sensors, energy technology and electronics.
- Metamaterials, material structures that react to electromagnetic waves, with applications in diagnostics, light and sound absorption, antennas and lenses.
- Biomaterials, materials that interact with biological systems, with applications for drug delivery, burn wounds, biosensors and cardiovascular devices.
- Piezoelectric materials that offer electricity from movement. Applications in sensors and guidance systems.

As many already existing innovations are backlogged because of the limitations in material sciences, basic research in this area can have a major implications for future change.

3 Toolkits for Change

3.1 Indicators of Change

Effective change requires an understanding of why to change. In order to answer the 'why', it is required to understand the past, current and expected environment. From that context comes the ability to clearly define the goal, how reasonable or unreasonable it ever may be. With understanding of the environment, the goal and resources comes the plan, and from there comes action. In short:

1. Assess now. Analyze the context of operations.
2. Define or redefine goal.
3. Plan route to goal. Identify people and resources that need to change. Identify required behaviors from employee's.
4. Act.
5. Go to 1.

Because this 'information, strategy, tactics, action' -loop depends on information, this chapter reviews information gathering models and tools from relevant points of view: before and during action.

3.1.1 Analyzing Context and the Current Operational Environment

Action depends on information and should be preceded by gathering of it. Basic frameworks for understanding the current environment are trend analysis, competitor analysis and analysis of the organization.

PEST analysis, a form of trend analysis originally suggested by Francis Aguilar in his 1967 book Scanning the Business Environment [Aguilar, 1967], describes political, economic, social and technological factors of environment. Usually added to these are legal, environmental and demographic aspects of the operational environment:

- Politics. How the government and the public sector affect economy.

- Economic environment. For example, economic stability, expected growth, disposable income, home ownership, employment status, business access to credit and effects of globalization.

- Social factors. Culture and social trends.

- Tech. Existing and emerging technologies, innovation and R&D.

- Legal. Legal aspect of politics.

- Environment. Ecological factors, climate change, climate and weather. Environmental aspects of politics and law.

- Demographics. Population growth rate, population age distribution, ethnicities and languages. Demographical aspects of the society.

PESTLEWeb (a graphical tool for mapping these aspects of operational environment and their relations to each other [Collins, 2016]) creator Rob Collins suggests estimating likely probability and impact of each individual data point to create a scatter plot of different external possibilities, in order to assess the likely future scenarios and best courses of action. This kind of graphical mapping could also be applied into organizational and process analysis, when considering current, future and ideal states, as well as the action plan for future (more in section 3.2.1, value stream mapping) [Bicheno et al, 2009].

Competitor analysis is the second aspect of keeping track of outer change, where competition is identified and evaluated from different viewpoints of the markets:

- Competition levels. Competition is evaluated in the context of customer needs, and product and brand selection.

- Competitive forces, described in Porter's five forces model.

- Competitor behavior and actions.

- Competitor strategy. Price, product differentiation and service.

Michael E. Porter's five forces model [Porter, 1979], a framework for competitor analysis, helps in describing an environment of competition via identification of relevant market forces:

- Bargaining power of suppliers. If suppliers are hard to replace, they have a degree of control over the organization.

- Bargaining power of buyers. How customers or groups of customers affect markets, for example via large volumes.
- Threat of new entrants, as profits attract competition.
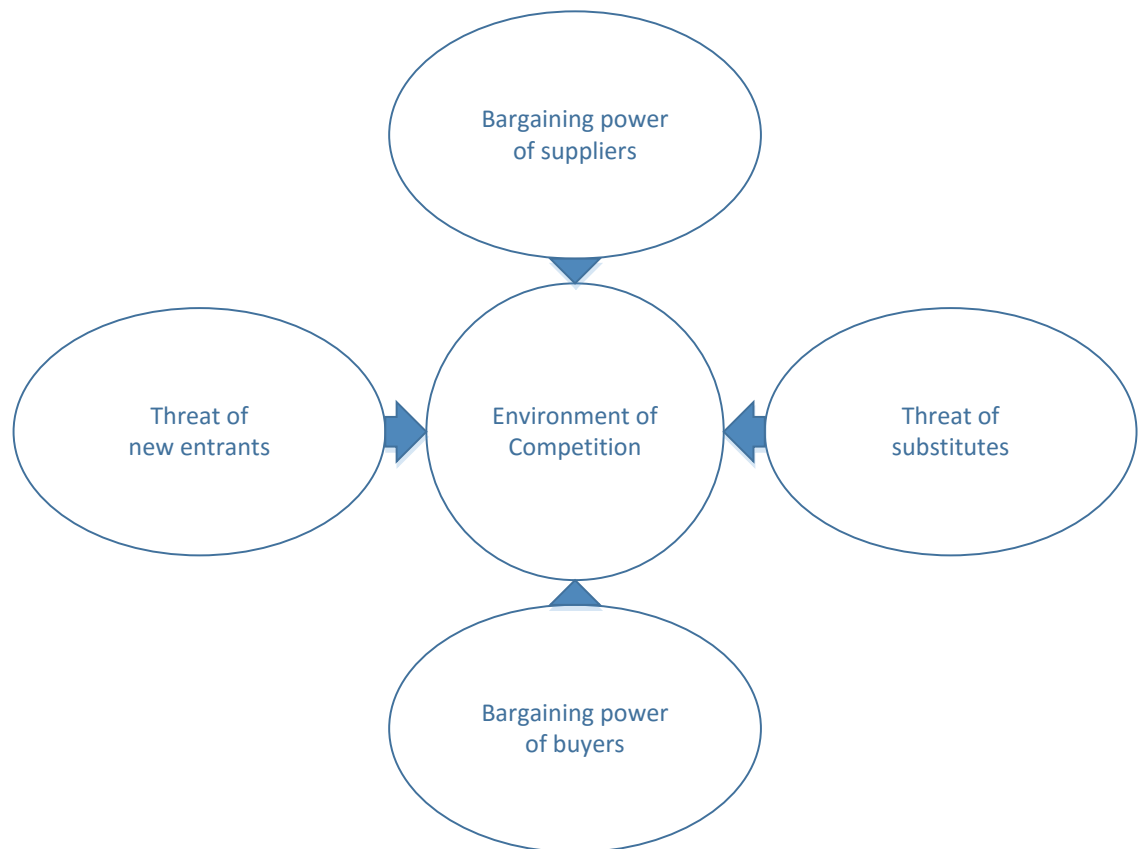- Threat of substitutes, especially new technologies.

Figure 6. Porter's five forces [adapted from Porter, 1979].

The third aspect of context analysis is the organizational analysis, where internal environment and competencies of organization are assessed.

In organizational analysis benchmarking can be an appropriate tool and starting point, as understanding an organizations internal strengths and weaknesses is hard without comparing them against the industry leaders. Benchmarking combines competitor analysis with organizational analysis, where organizations processes, products, strategies and competitive advantages are compared to other similar organizations, or by com-

paring own practices to known best practices [Prašnikar et al, 2005]. Noting and comparing the organizational context using Galbraith's star model mentioned in section 2.3.1, creates a picture of current internal state in comparison with other organizations.

After creating the basis for understanding the differences between organization and its competitors, comes the ability to objectively analyze internal competencies, i.e. strengths and weaknesses in employee skills, organizational knowledge acquired via organizational learning and technological proficiencies the organization possesses.

The basic tool that can be used to tie all these aspects of trends, competition and internal analysis together is a SWOT analysis, where strengths and weaknesses of the organization are compared with expected opportunities and threats in the external environment. Strengths and weaknesses come from organizational analysis, whereas expected opportunities and threats are understood via trend and competitor analysis.

3.1.2   Measuring Progress with Balanced Scorecard (BSC)

Continuous context analysis creates the basis for comparison between different points in time, and a way to measure progress when combined with standard business data. Developed during the late 1980's, the balanced scorecard has been a somewhat evolving method of tracking and reporting strategy performance and objectives. Basic framework of BSC comes from selecting a mix of financial and non-financial data items, having targets and reference values for said data items and acting when necessary. Original perspectives in BSC were finances, customers, internal management and processes, and learning and growth [Kaplan, 2010].

The current third-generation balanced scorecard emphasizes strategic objectives and achieving set goals. So-called destination statement is drafted to describe the organizational vision in a set point in time, usually few years from now. After that, strategic linkage model, a strategy map, is created to describe how current and short term activities link to this vision.

Considering the often quoted failure rate of 70-90% in implementation of strategy (although it seems to be hard to quantify exactly [Cândido et al, 2015]), Robert Kaplan and David Norton have suggested that organizations could find benefit in creating a so called Office of Strategy Management (OSM) directly linked to CEO and executive

team, in order to guide the integration of strategy into management processes [Kaplan et al, 2005]. Kaplan and Norton identified nine possible roles for OSM.

The core processes:

1. Scorecard Management. OSM designs the balanced scorecard, oversees data collection by other departments and communicates with internal auditing ensuring that collected data is valid.
2. Organization Alignment. By using BSC and its strategic linkage model, identify possible synergies in organization, linking business units, support units and external partners with organizational strategy.
3. Strategy Reviews. Management strategy reviews are used for mutual learning on organizations current state, and to make strategy adjustments. OSM drafts the meeting agenda and briefs the CEO on latest findings in BSC.

Desirable OSM processes:

4. Strategy Planning. Help the CEO and the executive team to create and implement the strategy, as well as refine it continually as new data comes in.
5. Strategy Communication. Educate the employees about the strategy.
6. Initiative Management, i.e. macro level change management. Strategic initiative monitoring and coordination across the organization, even when done in other business units.

Integrative processes (OSM integrates strategy to a process run by others):

7. Planning and Budgeting. Coordinated with other business units, links finances (budget targets), human resources (hiring and training), information technology (strategy planning requires data that requires IT), and marketing (customer value) to strategy.
8. Workforce Alignment. Coordinated with the human resources, link the employee's goals, compensation and development plans with strategy.
9. Best Practice Sharing. Coordinated with unit responsible with organizational knowledge and learning, a process is created to identify and share best practices across the organization. [Kaplan et al, 2005.]

This basically lays down a model of structured framework for aligning organizational objective and methods with the organization itself. Control of progress, information relating to it, and continual re-aligning are consolidated across the organizational units, leading to a possible change in the strategy (differentiation) and implementation (being better) of said strategy.

3.2 Lean as a Model for Continual Improvement

Popularized by Toyota, lean is both a philosophy and system of operations, and a set of tools for identifying and reducing waste. In a way, lean is a model for continual search for the 'best way', model for positive change. In the Toyota production system, 'The Toyota Way', the focus is not on tools but on improving the flow and smoothness of work, that in turn leads to reduction in waste and increase in value. [Ohno, 1998; Bicheno et al, 2009.]

In their book Lean Thinking, James P. Womack and Daniel T. Jones explained the five lean principles [Womack et al, 2010]:

1. Value from the customer's point of view, i.e. customer wants results, not products.
2. Mapping and measuring the entire value stream and its weakest links.
3. Flow of value, avoidance of batch and queue production.
4. Pull. In the framework of flow, pull means responding to customer demand without overproduction. Build to order instead of forecast, with minimal stocks.
5. Perfection. Delivering what the customer wants, when customer wants it, while offering it with fair price and minimizing overall waste.

Toyota in turn described their version of lean with three M's:

- Muri (overburden): Unreasonable distribution of work, that is fixed with standardized work. Concept focuses on preparation and planning of the work process, i.e. proactive design.
- Mura (unevenness): Workflow has queues or high variability, that is fixed with just-in-time flow of work. Concept focuses on implementation of the muri work design.

- Muda (waste): Non value adding work, described with 'seven wastes'. Concept focuses on observed defects of muri and mura.

These 'seven wastes' of muda are the following:

1. Transport: Moving unnecessarily doesn't add value but causes some loss, while being wasted work in itself.
2. Inventory: Unnecessarily storing raw materials or work in progress doesn't generate value.
3. Motion: Machines or people doing unnecessary work.
4. Waiting: Waiting for next step is lost time.
5. Overproduction: Making too much, or ahead of demand.
6. Over processing: More work being done that customer wants or needs.
7. Defects: Extra cost from replacing defect.

From these comes the acronym used to remember the seven muda, 'TIM WOOD', although several authors have later suggested some additional wastes:

8. Non-used employee skills and waste of talent, doing work without adequate training [Ohno, 1998; Bicheno et al, 2009].
9. Service that doesn't meet customer demand, i.e. making the wrong product [Womack et al, 2010].

What is interesting in above points, is that even though lean was first developed for high value manufacturing industry, most principles apply not just to manufacturing and physical goods, but also to information and office jobs. These aspects combined describe lean in a nutshell: listen to your customers and adhere to continuous improvement [Bicheno et al, 2009].

3.2.1 Lean Toolkits

While lean is more than its combined toolbox, transforming an organization into a lean state of flow is often started by implementing some context appropriate tools. This section introduces some of those tools, in order to better understand the central concepts of flow and pull.

Total Productive Maintenance (TPM)

An approach to maintenance, TPM focuses on ensuring equipment availability (loss due to breakdowns and set-up times), performance (loss due to minor stops and reduced speed) and quality (loss due to defects at startup and run itself) [Bicheno et al, 2009]. Need of maintenance, be it planned or condition-based, comes from the fact that all physical things fail in time due to use, misuse or age. By understanding equipment in question and its expected age of use, planned maintenance can be used to extend its lifespan. In turn, condition-based maintenance is used as a response when some indicator shows that failure is imminent.

The central concept in TPM is overall equipment effectiveness (OEE) that is calculated from the above mentioned variables, with result in percentages.

$$OEE = Availability \times Performance \times Quality$$

The end result tells us de facto resource effectiveness, a number used to compare processes or resources with each other [Bicheno et al, 2009].

Another concept relating to TPM is takt time, the available work time divided by the average customer demand (pull) in the same time period; in a way, the rate of product flow in lean lexicon.

$$Takt\ time = \frac{Available\ Work\ Time}{Average\ Customer\ Demand}$$

A good target for TPM activities is when combined work time and wasted time, due to equipment availability losses, is larger than the takt time for a product [Bicheno et al, 2009].

Value Stream Mapping (VSM)

A usual change catalyst in lean, value stream mapping is a tool used to visually express the flow of value and production. Mapping starts by analyzing current internal processes and exposing waste in it, and designing a vision of possible future state. From there comes action plan linking the two together. Visual mapping process itself

resembles the PESTLEWeb tool mentioned in section 3.1.1, but the focus is more on internal value generation of organization instead of external environment.

<u>Redesigning Working Cells</u>

Layout design is the basis for use of lean tools, from workstation ergonomics to general location of workplace. Location of everything matters, when minimizing wasted work.

<u>5S</u>

The tool used to identify and reduce waste in working area, 5S abbreviation comes from five Japanese words translated into English as following:

- Sort. Throw out what is not needed and store what is seldom used.
- Set in order. Find place for everything and locate these items to minimize stretching and bending.
- Shine. Keeping everything tidy, e.g. daily cleanup routines.
- Standardize. Adopt standard procedures for previous items.
- Sustain. Make 5S a habit, with everyone participating.

In a way, this is a basic tool that creates the basis for solving mura, queues and variability in workflow.

<u>Visual Management</u>

Almost a part of 5S, visual management refers to seeing schedules, problem solving process, processes of standard work, quality and maintenance process visually [Bicheno et al, 2009].

<u>Kanban</u>

In lean, pull means demand from a downstream process. Kanban is the most popular pull system, done via signal cards, that is used to tell when goods are needed in upstream of this process chain.

Heijunka

Heijunka means production scheduling with smaller batches by mixing product variants within same process. Combined with kanban, it is a post-pox system for kanban cards, allocating time slots for production.

Just-In-Time (JIT) and Jidoka

Concepts in lean, instead of tools, mean same as flow and quality. These often require abovementioned tools to be implemented in order to be achievable.

3.2.2   Kaizen, Continuous Improvement

Improvement, i.e. positive change, is the central theme in lean, and kaizen is the Japanese name for it. Both a philosophy and a set of tools, Kaizen is used to question if old ways of doing things could be improved.

Kaizen Event

A structured improvement workshop, where problems and solutions are communicated, with hopefully concrete results. Usually last for several days, excluding preparation and post-event checkups.

IDEA-Cycle

An improvement cycle, used by Toyota for innovation and design.

- Investigate the problem
- Design a solution
- Execute the solution
- Adjust the solution, and prepare for next cycle.

Often used with five whys in kaizen events, IDEA-cycle could be thought as a basic framework for improvement.

<u>Five Whys</u>

A form of dialogue, where successive questions are used to find the root cause of problem. Usually expressed as 'why', but more structured approach could be the one below. [Bicheno et al, 2009.]

- What needs to be done? Why?
- When should it be done? Why?
- Where should it be done? Why?
- How should it be done? Why?
- Who should do it? Why?

Combined these could be thought of as a way to identify what needs to be fixed, what causes the problem and who owns the problem. With several iterations of this line of questioning, an answer hopefully emerges.

3.2.3   Quality, Lean and Six Sigma Combined

Six Sigma's focus is on eliminating defects and reducing variability in products. Term itself refers to variation, and therefore performance, in a process. Defects (loss in quality) come from this variation, and perfection is sought by improving the process. As defects can also come from mistakes and complexities in the process, lean has used so called poka-yoke (idiot-proofing) to prevent defects. Popular approach is to combine Six Sigma with lean, tools for both process flow and process variation.

The usual tools in Six Sigma are variations of W. Edwards Deming's plan-do-check-act cycle, e.g. DMAIC cycle:

- Define system, process and goals.
- Measure current process.
- Analyze data.
- Improve current process.
- Control process by continuing data collection and repeating cycle.

In this method, the focus is on process development via the use of statistics.

3.3 Review: Three Models of Change Management

There are dozens, even hundreds, of different change management models. The fact that there are so many models, implies that no single model is universally valid. But then again, the fact that these models have been created tells us that they are useful in some contexts, contexts being 'what is changed', 'how it is changed' and 'who is doing the change'. As most models seem to share similarities with each other, with some variations, it is useful to go through some models to establish what those similarities are.

3.3.1 Kurt Lewin's Theory of Change Management

Kurt Lewin's three phase theory of change management was based on his research on group dynamics and changing group life. For him, relevant questions were the actual process of change or the lack of it, and resistance to change. Also relevant was, that social habits create a 'force field' that pulls everyone back to previous habits, after conditions forcing change have passed. [Lewin, 1947].
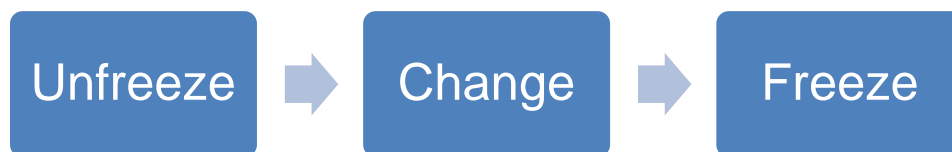
Unfreeze → Change → Freeze

Figure 7. Lewin's 3 phases change model.

Lewin's model in steps:

1. Unfreeze. Dissolve the status quo by establishing a need for change.
2. Change. Install changes and deal with ensuing confusion.
3. Freeze. Stabilize the new mindset as normal.

Lewin recognized the significance of change resistance in sociotechnical systems, and formulated his model on how to circumvent that problem.

3.3.2 Kotter's Eight-Stage Process

In his 1996 book Leading Change, John Kotter outlined an eight-step model on change leadership. In his view, the most important lesson was that even though these steps

can take a considerable time, skipping them will usually lead to a failure on implementing change. [Kotter, 2007.]

Kotter's model in steps includes the following:

1. Establish a sense of urgency. Communicate evidence that change is necessary.
2. Create the guiding team. Assemble a team with enough power to lead the change.
3. Develop a vision and strategy to direct the change.
4. Communicate the change vision and teach new behaviors by example.
5. Empower employees for broad-based action. Get rid of or change systems or structures that undermine the vision.
6. Generate short-term wins. Create visible results.
7. Consolidate gains and produce more change.
8. Anchor new approaches in the culture. Show the connection between change and organizational success.

Like Lewin's model, this is a linear top-down method of creating change where people are directed to a new state without much true participation.

3.3.3   ADKAR Change Management Model

ADKAR change management model was developed by Jeff Hiatt of Prosci in 1998 [Hiatt, 2016]. ADKAR model focuses on individual change and on how to create conditions for individuals to adopt new behaviors. It presumes that change usually happens first on individual level, and from there comes the successful organizational outcomes.

The model itself revolves around five outcomes that individual must achieve for change to be successful, while at the same time taking business side of change into account. [Hiatt, 2016.]

People side of ADKAR model in steps:

1. Awareness. Awareness on why change is needed.
   By: Communication.

2. Desire. Cause desire for change.

   By: Manage resistance and have sponsors for change.

3. Knowledge. Knowledge on how to change.

   By: Training.

4. Ability. Skills to implement change.

   By: Training.

5. Reinforcement. Approaches to make change stick.

   By: Communicate success. Iterations of change process.

Business side of ADKAR model in steps:

1. Business need. Identify opportunity.
2. Concept and design. E.g. consider Galbraiths Star Model, section 2.3.1.
3. Implementation. Implement solutions.
4. Post-implementation. Feedback and corrective actions.

By understanding the needs of an individual, correct support can be directed to ameliorate the changing situation. This model notes the need for some iteration, in contrast to previous models.

3.3.4 Common Themes in Different Models of Change Management

In its essence, change management is about managing people in changing contexts. As such, most models seem to concentrate on communication and motivation. Processes and outcomes change, but the mental states of employees should stay constant; change should be accepted.

Dissolution of status quo, making the actual change and making the change 'stick' seem to be found in each model (appendix 1). Viability of change management models in the regard of making the change 'stick' tends to be hard to verify. Sustainability of change is an area that could be studied with longitudinal research, but is rarely done because of the time needed [Putkiranta, 2011].

4   Case Study: HUS – The Hospital District of Helsinki and Uusimaa

4.1   Research Context

This chapter aims to assess the current and goal states of HUS, as well as some of the strategic tools and methods in use at HUS.

The chapter is based on an interview with Kati Ekholm, the head of risk management at HUS. Additional materials used include annual reports, assessment reports, brochures and HUS web pages.

4.2   Introduction to the Organization

HUS, The Hospital District of Helsinki and Uusimaa, is a joint authority formed by 24 municipalities, assigned to offer healthcare services to a population of over 1,6 million living in Uusimaa, as well as offering specialized healthcare requiring special expertize for the whole nation (e.g. organ transplants or infant heart surgery).

HUS has over 22,000 employees, being the second biggest employer in Finland. Nursing staff and physicians combined account almost 70% of the HUS personnel, while the rest consist of special employees and support personnel, as seen in figure 8.

Whereas the healthcare services are the core function of HUS, research and education are the essential operations in support of it. Helsinki University Central Hospital (HUCH), Institute for Molecular Medicine (FIMM) and Helsinki University Faculty of Medicine combined form Helsinki Academic Medical Center, the largest clinical medicine research center in Finland. Collaboration between HUCH and the university is the basis for training of skilled physicians, in addition to new research.
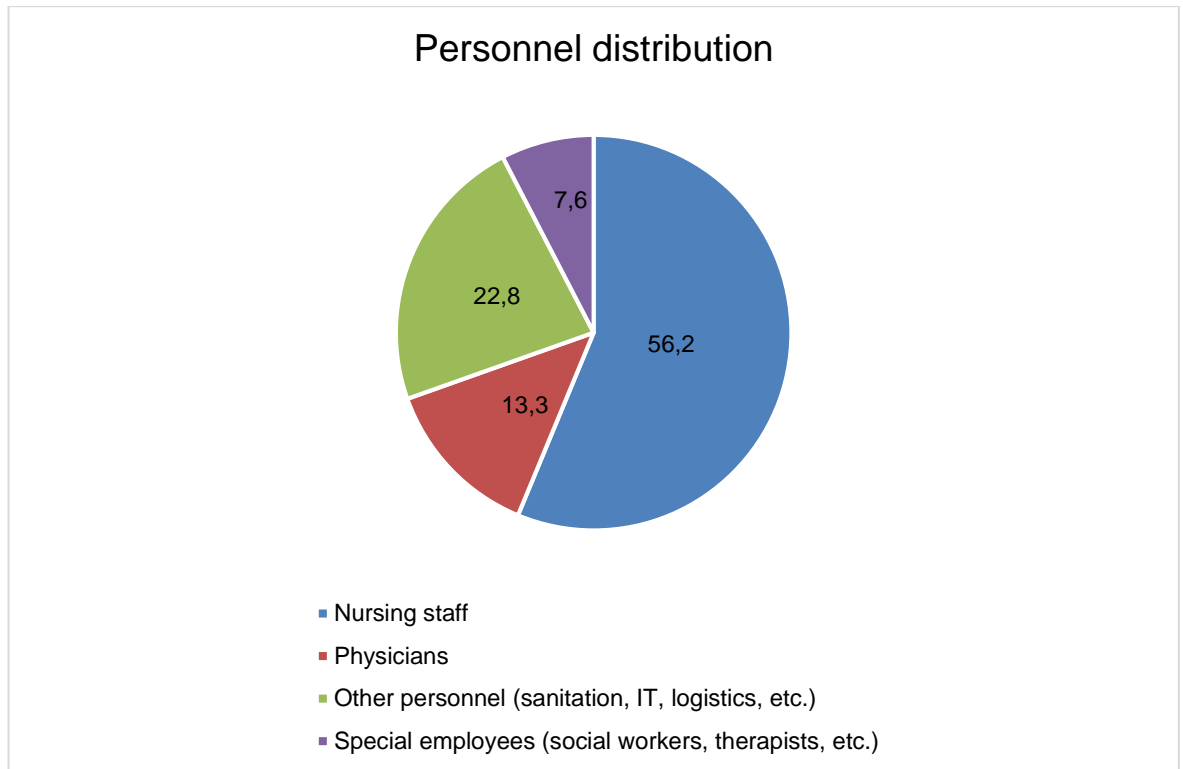
Personnel distribution

Figure 8. HUS Personnel distribution.

4.2.1 HUS Vision statement

In order to improve, and improve continuously, it needs to be known where one is and where one is going. Verbatim, the HUS vision statement in Finnish is as follows:

> "HUS on kansainvälisesti korkeatasoinen, uutta tietoa luova sairaalaorganisaatio, jossa potilaiden tutkimus ja hoito on laadukasta, oikea-aikaista, turvallista ja asiakaslähtöistä. HUS:n palvelutuotanto on kilpailukykyistä ja sen sairaalat ja yksiköt tarjoavat haluttuja työpaikkoja." [HUS Strategia 2012-2016].

The key points in the HUS vision statement are as follows:

- Being a world class hospital organization.
- Innovation and quality through research and education.
- Offering safe and high quality on time healthcare with customer as starting and ending point.
- Competitive service operations.
- Being a desirable employer.

This declaration of objectives leads us to the HUS strategy, that lays out how to achieve these goals.

4.2.2 HUS Strategy Statement 2012-2016

Drafted in 2011, the current strategy in use has identified several key focus points of action for HUS.

<u>Customer experience</u>

In order to develop quality healthcare and better customer experience, the results of work have to be measurable, and therefore comparable with other healthcare providers and units in organization. HUS has identified this, and conducts quality management by gathering patient feedback, as well as vertical input inside the organization.

Patient safety is an emerging discipline of past few decades that focuses on preventing medical errors through analysis of said input. Accidents, risks and adverse events are reported via in-house reporting systems, and reacted on appropriately. Education of staff is in key role in developing this error prevention, as change in processes often requires new skillsets.

As customer experience comes from interaction between organization and customer - and in healthcare that interaction is often lifelong - developing positive customer experience is a multifaceted process, from cutting waiting times (value chain optimization) to error reduction (quality management) and best practice sharing (continually evolving evidence-based medicine.)

<u>Competitiveness</u>

The Finnish law for healthcare dictates that the patient can choose his/her own place of treatment. What this means for healthcare providers is increased competition, where competitive advantage comes from quality of service, availability, queue times, service price and customer experience. For HUS this creates a demand to create and upkeep competitiveness in relation to other healthcare providers.

Collaboration with basic healthcare

In Finland basic healthcare, including preventive healthcare, is delivered through municipal health centers spread throughout populated areas. Social services, for example eldercare, special care for disabled and family counselling are in the process of being integrated and aligned with basic healthcare, in order to remove redundancies. Patient registries coordinated by HUS are the basis for this multiprofessional cooperation.

Research and education

As the human body is complex, so is diagnosing and treating problems in it. Medicine is a skill intensive field of work that requires continuous education and training for individual physician, in order to keep up with one's chosen field of expertise. As such, HUS strategy statement has identified education as one of the important focus points for the organization. And on research, as said earlier, HUS collaborates with Helsinki University Faculty of Medicine and Institute for Molecular Medicine through Helsinki University Central Hospital, having a total combined 1500-2000 individuals in 450 research groups creating some 2500 research papers per year [HUS Tutkimusstrategia 2014-2016].

It should also be noted that from the society's point of view healthcare offers remarkable return on investment, as developing human capital is an expensive and time intensive process; therefore, research and education in healthcare could almost be seen as essential to economy [Medical Research Council, 2008].

4.3   Lean in HUS

For the past several years, beginning from 2009, HUS has implemented several lean-projects, first in HUSLAB and HUS Medical Imaging Center, and later in clinical units [Mäkijärvi, 2010].

This section reviews some aspects of lean that apply specifically to healthcare, as well as concrete steps that HUS has taken in implementation of lean.

4.3.1   Examples of Lean in HUS

<u>HUSLAB</u>

HUSLAB is a laboratory enterprise offering support services to HUS, being the biggest provider of clinical laboratory services in Finland. Laboratory samples are collected in over 70 sample collection sites at physician's referral, for both basic healthcare and specialized healthcare.

When HUSLAB begun to plan for a change in its business premises some years ago, available space was to shrink from 9600 m² to 8200 m² leading to an increased need of efficiency. Lean project to seek that efficiency was started via value stream mapping, identifying processes that could be improved in the new premises, as well as in the old ones. Preliminary pilot projects lead to shortened queuing times and increased customer satisfaction. [Mäkijärvi, 2010.]

<u>HUS Medical Imaging Center</u>

Like HUSLAB, HUS-Imaging is a municipal business enterprise offering support services to HUS. HUS-Imaging offers medical imaging, physiological and neurophysiological examinations and related services, as well as medical engineering services.

The first lean project in HUS-Imaging begun in 2011 at Jorvi hospital magnetic imaging unit. Demand in magnetic imaging was rising by almost 10% a year, and the goal in this project was an >10% increase in the amount of examinations. This goal was achieved, as the amount of examinations rose from 112 to 123 per week. [Mäkijärvi, 2010.]

<u>Jorvi Emergency Care unit</u>

Jorvi hospital has a round-the-clock special healthcare emergency unit, servicing some 140 patients per day. Processes for patient care were identified as a possible subject for improvement, as the queues were long, patients were dissatisfied, and there was a shortage of staff.

Development of the triage model, the use of a triage nurse as the first line in emergency care, was identified as a good project. The triage nurse speaks with the patient and assesses the urgency for care. Depending on the time of day, the waiting time could be long. Due to changes made in triage, average waiting time was lowered from over 10 minutes to little bit under 2 minutes, and the longest waiting times were lowered from 30 minutes to a little bit over 5 minutes. [Mäkijärvi, 2010.]

4.3.2 Benefits of Lean for HUS

Most of the topics mentioned in section 3.2 apply also in healthcare. When considering lean, the concept of value is essential. In healthcare it could be formulated as:

$$Value = \frac{Delivered\ Care\ and\ Customer\ Experience}{Cost}$$

Value is increased either by improving delivered care or decreasing cost. In a 2014 paper on systematic review protocol for lean in healthcare, its authors identified some possible primary outcomes to increase the customer value [Lawal et al, 2014]:

- Health system improvement outcomes. E.g. time for admission, collection and triage, time with doctor and in examination room, length of stay and waiting times.
- Patient outcomes. Patient satisfaction, mortality rates and re-admission.
- Professional outcomes. For example, employee satisfaction and overtime.

Value stream mapping is an essential tool when identifying and improving these processes.

On the topic of wastes, as well as the standard seven wastes of lean, there are also the seven service wastes.

1. Delay. Customer waiting in queues.
2. Duplication. Customer having to re-enter same data to several forms, or answer same questions repeatedly.
3. Unnecessary movement. Poor layout design, causing too much movement and possibly leading to queueing several times.
4. Unclear communication. Wasting time on poor communication.

5. Incorrect inventory. Delay or call off of service because of lack of inventory management.
6. Opportunity lost. Inadequate customer retention.
7. Errors. Poor process design leading to errors in transaction.

These remind us of customer perspective, instead of organizational perspective in the topic of muda [Bicheno et al, 2009].

These factors combined gives us a review on lean for HUS. There is an impressive potential for value to be gained in lean, for health system, patients and employees alike.

5 Conclusions

"It is the nature of all things to change, to perish and be transformed, so that in succession different things can come to be."

Marcus Aurelius, Meditations. Book XII: 21.

5.1 Key Theoretical Findings

Considering that everything, including life itself, is about change, managing change could be seen as a daunting task. On macro level, the quantity of environmental variables requires us to create appropriate models in order to understand the subject at hand. Whereas on the individual level there are whole fields of study trying to explain how human mind works. But most change in itself is trivial, and complexity only comes into play when viewed as part of larger perspective.

Employee motivation, the will to act, can have a tremendous impact on the success of an organization. Organizational culture, the sum of individuals, can likewise make or break the whole. These aspects of organization, in a way the acceptance and sustainability of change, form the classic challenges of change management. When combined with fast paced change of today, those challenges are amplified.

How to implement change? Change management is about management of people and processes in changing contexts, and as such there is no one model that would fit all situations. But on an individual level, most needs are shared between people, and those needs should be considered.

The findings suggest that the practical application of change management has considerable challenges in it; on individual level fear of change and the difficulty of motivation are almost universal, regardless of context. But at the same time, considering the expected changes in the future, change management practices and models offer an advantage that cannot be ignored.

5.2   Key Empirical Findings

The use of lean in HUS was reviewed and it was concluded that lean has increased value for both the customer and organization. Undoubtedly the use of lean tools will continue and expand in HUS, as well as in other hospital districts in Finland.

What are the problems in healthcare that need to be solved, and how should those problems and ensuing success be measured? The biggest value in healthcare comes from the extension and enhancement of life, from individuals' continued ability to function. Considering the current trends in technology and the expected value in cognitive research relating to IT, it could be argued that that is where the money is ultimately at, even for healthcare. A recommendation engine that has the combined knowledge of all published research on given symptoms and medical problems relating to those symptoms, as well as the patient history, would be priceless.

How would that change healthcare in Finland? How close are we to achieving that? IBM's Watson for oncology is already a step in that direction. These are interesting questions to consider and a possible topic for further study.

A review of lean in healthcare was post hoc a good choice for the thesis case study as the field of public healthcare optimization through the use of lean is somewhat new in Finland.

5.3   Further Discussion on Change Management

In the end, the goal of change management is to keep the organization on its course towards its chosen vision, regardless of regular realignments that are needed. This requires an ability to resist failure. If failure still occurs, it requires an ability to recover from it, as well as to learn from it. Even though this also applies to an individual, organizations have the possibility of taking a structured approach that specifically targets this fragility, the problem of change, inherent in all systems. The office of strategy management could be one approach to realizing this.

In psychology there is a maxim, 'the best predictor of future behavior is past behavior'. In other words, changing behavior is hard. Why is that?

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Appendix 1. Three models of change management.

Lewin	Kotter	ADKAR
Unfreeze	Establish urgency	Awareness
	Create coalition	Business need
	Vision and strategy	Desire
Change	Communicate vision	Concept and design
	Empower employees	Knowledge
	Short-term wins	Implementation
Freeze	Consolidation	Ability
	Anchor to culture	Post-implementation
		Reinforcement