

IMPACT OF SOCIAL THREATS AND THEIR EFFECT ON ORGANIZATIONAL CHANGE PROCESS EFFICIENCY

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VETENSKAPLIG METODIK, PSYKOLOGI III, VT 2018



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The human brain is sensitive to threat. Loss in Status, Certainty, Autonomy, Relatedness and Fairness – SCARF – is considered threatening. Threat creates a stress response and stress impairs cognitive functions as problem-solving, decision-making, learning and emotional control. The purpose was to identify differences between well-functioning and non-well-functioning change processes and their relation to SCARF. A total of 55 change processes were investigated. The result indicated a correlation between stress, productivity and quality. The result also showed that 20 out of 25 measured items had a significant mean value difference between “good” and “bad” processes. A multiple regressions analysis indicated that a high degree of Certainty predicts a high degree of Change Process Efficiency with 50 % of the variance possible to explain by the variance in Certainty. More research on SCARF factors and how to measure those in change processes is needed. The area is important since it can create more efficient change processes.

Change is challenging, yet it is necessary. The increased speed of technology development as well as the overwhelming access to information has created an ever-changing environment requiring adaptation, for individuals and organizations. Managers and employees are with a racing speed facing changes in *who* to work with, as new people are added or removed from the teams, *how* to work, as new processes, routines and systems are introduced and *where* to work in terms of office space, new layouts and shifting of locations. The increased speed makes it more and more important to manage the change processes as fast, efficient and painless as possible. This means that the process becomes important, not only the end result. An organization able to manage change will face less disturbances in stress, resistance and productivity and will be more attractive to both customers and employees (Kotter, 2012).

Even though the notion of “70% of all organizational changes fail” lacks evidence (Hughes, 2011), the common experience is still that too many changes are perceived as cumbersome and that they create a loss in productivity during the process. The absence of a correct number, is partly the lack of an easy measurement and clear definition of what is a successful change. This is partly because several changes usually intertwine and are therefore difficult to separate and, also because the definition of when the change can be considered implemented and done is in many cases vague.

An efficient and successful change process is ready within given time plan and estimated budget. It is a process that creates as little resistance in the organization as possible, and a process allowing for employees to feel part of the process enough to support it and add their competence. The successful change process is a process where stress levels are kept to a minimum and motivation remains high. Obstacles occurring during the process are

dealt with in a constructive and creative way, the quality delivered to customers is not being tempered with and the productivity and efficiency in daily work is undisturbed.

This paper will cover the efficiency of organizational change processes from a brain efficiency perspective. This will be based on the idea that a brain exposed to stressors will enter a stress mode which will impair cognitive abilities and in its turn negatively affect change process efficiency and successful change management.

The brain's main focus

From a simplified evolutionary perspective, the main task for the brain is to keep the bearer alive long enough to ensure that the genetic base is reproduced and kept alive, preferably a couple of generations. This is in line with the Biological Imperative and the need for a living organism to protect and maintain its existence and survival.

The brain's circuitry for identifying and minimizing threat is far bigger than the reward circuitries. Or as Baumeister, Bratslavsky, and Vohs (2001) puts it: "Bad Is Stronger Than Good". The self is more motivated to avoid the bad than pursue the good, which means minimizing threats and maximizing rewards. A threat is, in this aspect, a fear originating in an expectation of pain or possible death, detected by input from the brain's sensory systems. Threats may come in the form of physiological threats, for example the risk of suffering, being killed or receiving physical pain. Threats that would include fear of large growling animals, injection needles and an angry face connected to hands holding a baseball bat.

As social animals, humans have also developed a fear response to a number of social factors. Factors that in modern society are non-lethal, but by the brain perceived as threatening and painful. Research has shown that social fear, like for instance being abandoned induces real pain, just like physical pain (Chen, Williams, Fitness & Newton, 2008), and that it can be dampened the same way, with normal painkillers. According to Chen et al, the same neural systems are being affected and efforts to avoid pain and seek pleasure are the same, whether it is physical or social.

The human brain is so under-developed at birth that a child is dependent on a social and caregiving environment during many years in order to survive childhood. According to evolutionary theory (Harari, 2012) the reason for this premature birth-giving is the combination of an upright walking position that requires a narrower pelvic and the large size of the fully developed human brain compared to other species. As a consequence, the human brain needs to be pre-set to seek social interactions and fiercely avoid loneliness in order to survive. A need that remains into adulthood even though there is less physical need for it, especially not in the modern society. The wiring is so strong that having social needs threatened, even as adults, will form a chronic stress response affecting both mental and physical health (Rock, 2008). Understanding the factors behind social threats and how to avoid them is therefore important not only in order to effectively manage changes in organizations, but also to form a well-functioning and healthy human society.

Threats to the Brain - SCARF

Based on social cognitive neuroscience theories, the components of threat and reward was in 2008 combined into the SCARF model by David Rock. The five domains that according to Rock activate strong threat- and reward responses in the brain are Status, Certainty, Autonomy, Relatedness and Fairness. These social needs are, according to Rock, perceived almost as important to humans as the need for food, drink and shelter. If any of the SCARF factors are threatened, the brain shifts into a survival and stress mode, desperately trying to gain them back. This stress mode will impair higher cognitive functions and therefore the ability to effectively deal with change (Arnsten, 2008).

Status

Status, or social rank, is perceived as someone's relative importance in relation to others. High status has shown to create lower baseline levels of cortisol, meaning lower levels of stress, and in correlation increased health and longevity (Marmot, 2006). This has by Marmot been labelled as the Status Syndrome. Low status increases stress levels and negatively affects health.

According to Rock (2008), status in the work place will be affected by the importance of tasks, the organizational hierarchy and how much value is given someone's thoughts, ideas and work. Status is relative and there is a risk that increasing one person's status will be on the behalf of someone else. Yet, it does not need to be a zero-sum game since the comparison can be as a team and also in relation to the former self. Lowering a golf-handicap is increasing the sense of status as well as learning new skills or beat an old record on the race track. The brain has the ability to compare the former self with the present and if the present is better than the former, the internal perception of status increases (Rock, 2008).

Status may be highly affected during an organizational change process, as it is affected by someone's hierarchical place in the organization. The value of someone's position, the "box" in the organizational chart, and its connections to other "boxes" may be threatened. The status of the manager and the importance of the responsibilities given will affect the sense of status. Where someone is physically seated may also affect the perceived status – the size of the room, window seating in the open landscape, which floor etc. How much someone's input and ideas are valued in the change process will also affect the sense of status. Many of the factors affecting the informal status are equally important for the individual.

Believing that maintaining status quo, not changing, would negatively affect status in the future could give a sense of urgency and a higher willingness to change. A belief that a proposed change will lead to higher status could improve the motivation for change. Being used as an expert and sensing the importance of one's contribution and value in the change process may create a personal sense of status during the process. And a feeling of being part of a winning team, becoming even stronger by the change, will surge both pride and status.

Certainty

The brain is a meaning- and prediction-making machine with high focus on detecting and creating patterns that match (Kahneman, 2011; Lieberman, Gaunt, Gilbert & Trope, 2002). When things are predictable the brain can work on autopilot which is an energy saving way of operation. The brain will therefore fight to avoid uncertainty and seek certainty wherever possible in order to protect itself from unnecessary energy consumption.

Uncertainty is an inevitable challenge during change – “We know what we have, but not what we will get”. Learning something new might require following a new procedure until it becomes a natural habit, an energy consuming task for the brain. New understandings, beliefs and thoughts will require cognitive resources until they are integrated – How will changes on paper work in reality? Why is there a change, what is the rationale and what are the steps? The need for information during the change process is often endless. Recognition is on the other hand rewarding. Business plans, visions, strategies, budgets and clear reporting structures are ways to increase the sense of certainty, the future suddenly appears predictable.

Believing that maintaining status quo, not changing, would lead to insecurity and unclarity in the future could give a sense of urgency and a higher willingness to change. A belief that a proposed change will lead to a higher degree of clarity could improve the motivation for change. Clear and frequent communication from the change team in regard to time plans, progress, problems and action plans will create a sense of certainty and a feeling that nothing is held secret or that no hidden agendas are at play. Information is key during a change process and the need will sometimes be endless during a change process.

According to Rock (2009), the certainty of uncertainty may work as a relief for the brain, knowing that things will be uncertain for the coming weeks brings a certainty into an uncertain situation. This works especially well if given a date when more information will be presented.

Autonomy

Autonomy is about exerting control over one's own environment, being able to influence the situation, the sense of having choices. Knowing that the environment can be influenced and that choices can be made means that more pain and challenges can be accepted (Leotti, Iyengar & Ochsner, 2010). A study made by Muller (2012) indicated higher unpleasantness from painful electric skin stimuli for the group being unable to control when an electric shock was applied within a 10s interval. The subjective helplessness was strongly correlated with the perceived pain intensity ($r = .59, P < .001$).

Thompson (1981) refers to several studies showing that it hurts less if it is possible to control it. This has been shown both with patients able to self-administer pain-relief, and test-persons given the option to abort the test at any time when pain has been part of the test. In both cases, the individuals tolerate more pain than individuals without that option. Research also shows that groups with higher degrees of control and autonomy stay healthier and live longer in nursing homes (Thompson, 1981).

The evolutionary explanation to autonomy is probably partly connected to certainty. Being free to make choices will increase the level of certainty compared to being at the mercy of others (Rock, 2009). The other explanation is that the state of being helpless, i.e. having no autonomy, has shown to be lethal among humans as well as animals. For humans, being in a state of helplessness was not a good state in order to survive 50.000 years ago. Helplessness would create an easy target for predators and would not help in gathering any type of food. The freedom and ability of free choice has become a need for human mental health.

Autonomy is challenged during change since larger change processes leaves little room for everyone to have their say and make their own decisions. In many change processes, someone else is deciding who should work with whom, which processes to follow and what systems to use. Choices, perceived control and the chance to influence are limited.

Believing that maintaining status quo, not changing, would lead to less freedom and possibility to make choices in the future could give a sense of urgency and a higher willingness to change. A belief that a proposed change will lead to a higher degree of autonomy could improve the motivation for change. Allowing for individual adjustments, choices and decisions during the process will increase the feeling of autonomy. An understanding of why and how the process is performed, even if that means limited personal autonomy, may also lighten the burden.

Autonomy can be perceptually increased by allowing for choices even when the task is clear – “do you want to have the meeting in the cafeteria or in my office?”, “Do you want to send me the report on e-mail or pop by?”. The choice in these cases is not if a meeting shall take place or if a report shall be written.

Relatedness

Relatedness is built on a sense of safety, trust and belonging to a group. This is an old evolutionary need where the safety of the clan was crucial for getting the food and shelter required for survival (Rock, 2008; Harari, 2012).

Several studies using the so called Cyberball game, have shown an extensive pain response when feeling excluded (Hartgerink, van Beest, Wicherts & Williams, 2015). Cyberball is an experiment where the test person believes that he/she is playing a ball tossing game with two other persons over a computer. That is of course not true, the game is rigged in a way that makes the ball being tossed around evenly between the three players for the first minutes and after that the other two. i.e. the computer, starts ignoring the test person and tosses the ball only between each other. The social pain reaction to this has shown to be intense both from a self-evaluation perspective and from fMRI scans (Hartgerink et al., 2015)

The brain has two different circuits for handling information about people belonging to ingroup versus outgroup (Rock, 2008). People like ourselves, ingroup, are interpreted by the same neural networks that handle internal thoughts about ourselves, while people different from ourselves are treated differently from a neurological perspective. Ingroup relations create a flow of oxytocin (Rock, 2008), which is a hormone that among other things generates trust. Trust is an important factor for efficient cooperation (Harari, 2012). In order to quicker create ingroup out of outgroup relations, physical contact like

handshakes, name swapping and finding areas of mutual interest where we think alike work to speed up the process (Rock, 2008).

In a change process relatedness may be threatened when new groups form, and cooperation shall be made in new ways. New seating may form new constellations both for work and coffee breaks. New people coming and others leaving break up the familiar social structure, old competitors might be new allies.

Believing that maintaining status quo, not changing, would lead to conflicts within the team could give a sense of urgency and a higher willingness to change. A belief that a proposed change will lead to a higher degree of belonging and team spirit could improve the motivation for change. Involvement and common activities during the process will increase the sense of belonging and being part of a team, the feeling that the change is a common team effort where everyone counts.

Fairness

Humans have a well-developed feeling and social need for justice, and equality (Rock, 2008). Justice, equality and fairness are strong social driving forces. Being in an environment that is perceived unfair, even if it is towards someone else, increases the level of stress.

A classic psychological game, the ultimatum game, shows the human vulnerability to fairness (Cooper & Dutcher, 2011). The ultimate game stipulates that one person receives e.g. \$10 and gets the task to divide that with test person #2. When test person #2 is offered a too small share, he/she will reject the offer in total, preferring to leave the game with nothing at all. When the offer is less than 20% of the initial amount, only a quarter of the test persons will accept the offer. Another study (Tabibnia & Lieberman, 2007) showed that 50 cents was considered a larger reward by the brain than \$10, when it was 50 cents out of a dollar, compared to \$10 out of \$50. These studies and a number of others illustrate that fairness is both rewarding and fundamental for human wellbeing.

Fairness, justice and equality may be questioned during a change process. Did the right persons get the right promotions? Was everyone treated the same? Were decisions based on the right grounds?

Believing that maintaining status quo, not changing, would lead to injustice could create a sense of urgency and a higher willingness to change. A belief that a proposed change will lead to a higher degree of fairness could improve the motivation for change. A high transparency in decisions and reasonings behind will minimize the cause for false rumors. Creating a common feeling that the change will make it better for as many as possible may also dampen the feeling of threat.

All the SCARF factors are possibly threatened during a change process and many of the steps included in a change process may affect several of them in a good or a bad way. This is an impact that will affect the stress level and the cognitive functions of people involved in the change.

The brain's two systems

The brain is sensitive to external influences and the effects of the SCARF factors will affect how individuals will be able to cope with the change, maintain productivity and preserve quality during the change process (Rock, 2009).

The brain is one of the most complex structure mankind knows of. Neural networks are formed by more than 100 billion neurons where each neuron connects to several thousands of other neurons (Arnsten, 2008). Due to the complexity, all descriptions of the brain are by nature simplified models, and as a consequence, incomplete and to a certain extent incorrect. Several researchers have however made an effort and one of the more publicly known is Daniel Kahneman's division of the brain into system 1 and 2, the dual-process model (Kahneman, 2011). A similar division is made by, Lieberman et al (2002) where the two systems are called the reflective c-system and the reflexive x-system, where the c-system is similar to system 2 and the x-system to system 1.

According to Lieberman et al (2002), the x-system is the automatic, habit driven autopilot, an energy efficient system with the ability to do several tasks at the same time. It is the preferred system by the brain and the reason humans so easily fall back into old habits and ways of doing things. This is the system used when doing something that has been done many times before, before being forced to make a change. The x-system is energy efficient and capable of parallel processing, doing several things at the same time.

The c-system is the conscious, rational mind. It consists of what is in the conscious mind at any specific time. It can only run serial processes, one thing at a time, which makes it slow, and energy consuming. Whenever something is new or need conscious attention, the c-system kicks in. The brain will do its best to save energy and as a consequence use the x-system if possible, or at least save the capacity of the c-system to the fun rewarding things. This is one of the reasons that the brain will resist change, since change will require resources from the c-system before new thinking and behaviors become habits.

The limitation and serial processing of the c-system is also the reason why multitasking only works if all, but one task, are managed by the x-system. This means that it is for example possible to drive and listen at the same time, until something happens that requires focus and attention in the driving. When trying to multitask several tasks requiring resources from the c-system, a quick switch between tasks is made by the brain, a way of working that unfortunately is inefficient, energy consuming and leaves a "a dead blink" at every switch (Lieberman et al, 2002).

The c-system is used for analysis, decision making, problem solving, focus, learning, impulse control and emotional control. This system is physically part of the pre-frontal cortex (PFC) just behind the forehead (Arnsten, 2008). This is the brain structure that differs humans from other mammals, it is also the structure in the brain developed last in each human and is not fully developed until the mid-twenties (Fuster, 2001). On top of that, it is a system highly sensitive to stress. Stress that is automatically triggered by threat - physical or social (Rock, 2008).

During a change process, decision making, problem solving, learning and emotional regulation is of high importance. Change creates an unpredictable situation where problems will occur, decisions have to be made, new things need to be learnt and emotions as frustration and anxiety will flow and need to be controlled. This means that in order to successfully manage a change process everyone's c-systems needs to function well.

The brain's reaction to stress

Change will create a threat to the SCARF factors, and threat will create a stress response in the brain. This is a response that will affect the c-system (Arnsten, 2008), the system needed for learning, decision making, problem-solving and emotional control. During a change process these are vital functions.

The logical, rational c-system and the PFC needs to be sufficiently aroused to focus and function properly. This means that enough, but not too much, neural activity or firing of neurons is required. From a chemical perspective, this is supported by so called neuromodulators. These neuromodulators are not part of the synaptic signaling but adds to the process by helping the PFC strengthen important signaling and weaken signaling that will disturb the focus. The neuromodulators at work are Norepinephrine (NE) that strengthens signals and Dopamine (DA) that weakens them (Arnsten, 2008).

The amount of NE and DA, also called catecholamines, is the chemical description of the x-axis of the classical inverted U-curve describing the effects of stress, normally related to as stress level. The y-axis corresponds to the performance level of the PFC or c-system (Arnsten, 2008).

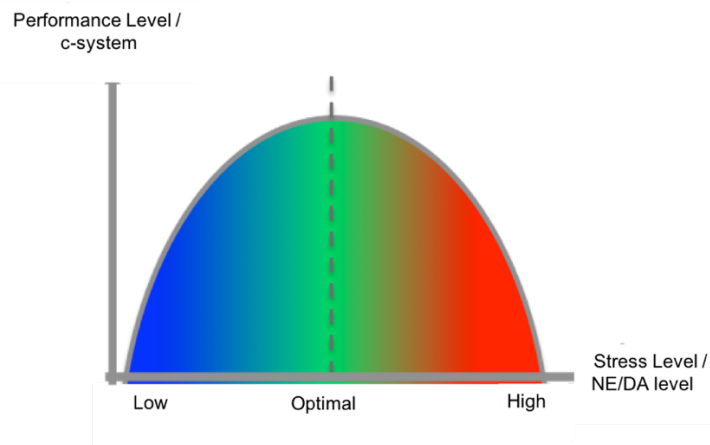


Figure 1. The inverted u-curve, relation between stress level (NE/DA level) and performance (c-system)

Low levels of NE and DA, the left side of the curve, will neither strengthen or weaken any signaling, which will make it very difficult for the brain to concentrate or focus on anything specific. In this stage, everything becomes of equal importance and the brain is easily distracted (Arnsten, 2008). The exact right amount of NE and DA creates a state of peak performance, by some called a flow. This is the state where decisions are easy to make, problems seem to have obvious solutions, new information easily falls into place and stressors are handled without emotional outbursts. With the mind at peak performance level, it is possible to create long term memories to support learning, hold several concepts at once to create new solutions and understand and compare the implications of different choices before making a decision (Arnsten, 2008). The c-system is at this point also viable for analytical thinking. A type of thinking that can process how new pieces correlate with old knowledge and experience, analyze what pieces of knowledge may serve for solving a problem and how this may be recombined into something new. A

thinking capable of analyzing the pros and cons of different options before making a decision (Arnsten, 2008). All this analytical thinking is important in a change process.

When the brain detects a possible threat, it initiates a stress response. From a physiological perspective, it is the Amygdala indicating the perceived strength of the threat. The more neural activity in Amygdala the more intense the emotion and the less activity in the PFC and c-system (Arnsten, 2008). From a chemical perspective, there is an increase in the levels of NE and DA in the PFC that moves the brain to the right in the inverted U-curve. The strengthening effect of NE has a tipping point where too high amounts will decrease the signaling instead of strengthening it. This means that excessive amounts of NE and DA will weaken all signals, the important ones as well as the noise (Arnsten, 2008). This means that too much threat will shut down the PFC, the c-system, and rely on automatic responses from the x-system. This is possibly an evolutionary heritage serving well in situations of imminent danger when there is no time for thinking or analyzing.

Threats that create stress lead to a situation where the brain cannot use its c-system effectively and this will lead to a predominant use of the x-system. This, in its turn, will lead to an increased level of biases, prejudice, stereotyping and generalizations (Kahneman, 2012), a type of thinking that may negatively impact sound decision making during a change process. The heightened activity in the Amygdala will also affect the Hippocampus and therefore the ability to form new memories and retrieve old ones. Hippocampus will need a certain level of Amygdala arousal to function at its best, but with too much arousal the function will be greatly impaired (Arnsten, 2008).

Being too far to the right in the inverted U-curve has not only cognitive implications but also cascades a number of physiological reactions. The built-in stress response, tailored for dealing with physical threats, is fight or flight. A high Amygdala arousal will interact with the Hypothalamus, which will affect both the sympathetic nervous system and the adrenal hormone system. The effect on the sympathetic nervous system is what creates an increase in heartbeat, respiration, oxygen to muscles and termination of digestion. The body will prioritize using its resources for getting away from the threat or fighting it. Blood will be pumped into the muscles and away from digestion. The sympathetic nervous system will also affect the Adrenal Gland, which will release the hormones Adrenaline and Noradrenaline into the blood stream (WebMD, 2017). From the Hypothalamus, with the help of the Pituitary Gland, ACTH hormones are transferred via the blood stream to the Adrenal Gland, which will increase the level of the stress hormone Cortisol into the blood. The Cortisol level can be measured and is used as a marker to monitor stress and stress reduction.

Not much has changed over the last 70.000 years in terms of how the body reacts to threat/stress (Harari, 2012). The chemical response still occurs, but with no fighting or running away, the adrenaline and cortisol stay in the system for too long, which creates an allostatic load or chronic stress response. This will cause poorer digestion and sleep, and a built-up muscle tension typically in the shoulders and whole upper bodies, which can cause headaches and neck problems. High level of stress over a long period of time, will lead to health issues including infections, depressions and increased risk of diabetes-2 and cardio-vascular diseases (WebMD).

Physical as well as social threats create a stress response. From a work place and change perspective the social factors are of the highest interest, these are also the factors that people living in modern society face on a daily basis (Rock, 2008).

Organizational performance and efficient change processes needs healthy well working brains, especially a well-functioning prefrontal cortex and c-system. High level of stress will impair the c-system; hence the organization becomes less smart, cannot learn new things, don't remember existing knowledge, and jumps to conclusions based on perceived threats.

A brain where the c-system is not working properly will rely on the x-system. The problem with that is that the x-system is highly biased and easily falls for stereotyping and prejudice (Kahneman, 2011). This will add to the difficulties in change where it is important to question old beliefs, be able to work with new people and refrain from jumping to quick conclusions. The organization will fail to logically solve arising problems and will get caught up in emotions with an inability to control emotional impulses. The perceived threat will focus the remaining attention on possible other threats. Conspiracy theories will emerge from random pieces of information put together without real connections and the ability to focus and incorporate new information will decline and a sense of not being informed will spread (Rock, 2009)

Hence the SCARF factors, when threatened, will create a stress response in the brain. The SCARF factors are easily threatened during a change process and this will induce the stress response, which in its turn will impair the c-system and the ability to manage the change process in an efficient and productive way.

Purpose of this paper

Change is difficult, much based on how the human brain is wired. Stressors and how stress affects cognitive abilities influence resistance, productivity and well-being. The rational is that the better the brain and its reactions to change is understood the bigger chances that change work can be better planned and executed in order to lessen the strains.

This paper has an exploratory purpose rather than testing a specified hypothesis. The purpose is to investigate what the differences are between a well-functioning change process and a non-well-functioning change process and how the different SCARF factors play a role in this. There is also an interest in looking at the relation between perceived stress and productivity and quality during the process.

This can be divided into three questions

- i) Does an increased level of stress negatively impact the productivity and quality during a change process?
- ii) What are the differences in actions, perceptions and reactions between a "good" and a "bad" process?
- iii) Is the Change Process Efficiency related to how the SCARF factors (Status, Certainty, Autonomy, Relatedness, Fairness) have been affected by the change and which of the factors are more important?

By better understanding the impact it may be possible to design cchange processes in a less threatening way and foresee where stress and inefficiency may arise. Better designed change processes will reduce both economical and health related costs.

Method

Research participants

Participants were picked from the researcher's professional network and represents a variety of companies, industries and company sizes. All participants are holding higher executive positions. A total of 85 people was asked to participate.

A total of 28 persons accepted and were interviewed covering a total of 55 different change processes. Private organizations accounted for 80% of the changes and 20% were made in the public and non-profit sector. Service offerings were the main line of business for 66% of the organizations while the other 34% mainly sold physical products. The median of people affected in each change process was 80. The changes occurred between the years of 1992 and 2018 ($m=2012$, $s=5,8$ year). The changes had different impacts, 64% of the changes had impact on WHO people would work with in the future, 91% on HOW people would work in terms of processes, routines and new systems, 27% had impact on WHERE to work in terms of office space and locations.

Procedure

Each participant was interviewed over the phone and was asked to describe two different change processes, one considered to have been successful in terms of a smooth process, and one considered being difficult. The participants were asked to step into the shoes of the people affected by the change and, to the best of their ability, answer the questions from that perspective. The focus was on the process, which in this case reflected the time period from the initiation of the change up till the change had been implemented.

Material

The interviews were conducted with support of a questionnaire. The interview started by asking the respondent to give an overall subjective evaluation of how well the change process was performed on a ten-grade scale (1=lousy, 10= brilliant).

Change Process Efficiency (CPE) was then measured with five items intended to reflect how the organization responded to the change process and the impact on daily work. A ten-grade scale was used (1=none, 10=massive). Mean value for each change process was used in further analysis. Item 3, 4, and 5 were used to analyze the relation between stress, productivity and quality. All items were developed by the author.

1. Overdue compared to initial time plan
2. Perceived resistance in the organization during the process
3. Increased stress level in the organization during the process
4. Negative impact on quality of product/service during the process
5. Negative impact on productivity during the process (efficiency in daily work)

Change Process Impact (CPI) was measured with 25 items intended to reflect what was happening during the process - expectations, reactions and activities. A ten-grade scale was used (1=not at all, 10=no doubt). The 25 items were intended to reflect how the five SCARF factors - Status, Certainty, Autonomy, Relatedness and Fairness affected the

organization during the change process. Mean values for each SCARF factor in each change process was used in further analysis. All items were developed by the author. See appendix 1.

Data processing

Table 1 shows intercorrelations, descriptive statistics and reliability for all variables included in the study.

Table 1. Correlations, means, standard deviations and reliability estimates (Cronbach alpha) for all variables included in the study.

Variable	1	2	3	4	5	6	M	SD	Alpha
1 CPE	1.0						6.38	1.95	.82
2 Status	.47*	1.0					5.86	1.93	.80
3 Certainty	.71*	.73*	1.0				6.13	2.00	.80
4 Autonomy	.48*	.82*	.78*	1.0			5.25	1.88	.77
5 Relatedness	.53*	.82*	.75*	.79*	1.0		6.24	1.93	.81
6 Fairness	.64*	.76*	.82*	.77*	.79*	1.0	5.75	1.89	.76

n=55. *p<.05

Cronbach Alpha gave a result >0,7 for all factors, indicating that the items for each SCARF factor had an acceptable internal consistency.

The correlation between the subjective CPE value for each process and the calculated mean CPE value based on the five CPE items, for the same process was .86 ($p<0.01$). This was tested in order to see if the five CPE items reflected the subjective measurement in a reasonable way.

Data Analysis

A bivariate correlation was made to look at the correlation between perceived stress level and negative impact on quality and productivity, CPE items 3, 4, 5.

An independent sample t-test was made to identify what CPI items showed the biggest mean value difference between “good” processes ($CPE \geq 8.0$) and “bad” processes ($CPE \leq 5.0$). This definition of “good” and “bad” was made by the author.

Data was also analyzed with a multiple regression analysis in order to investigate the impact of the different SCARF factors on the efficiency of the change process, CPE.

Results

Bivariate correlation – stress, quality, productivity

In order to study the relation between stress, quality and productivity, a bivariate correlation was made and is presented in table 2.

Data shows statistically significant correlations between the perceived stress level and these two (*quality* $r=.46$ $p<.01$, *productivity* $r=.67$ $p<.01$).

Table 2. Correlations, means and standard deviations for CPE values stress, quality and productivity.

Variable	1	2	3	M	SD
1 Stress	1.0			5.71	2.43
2 Quality	.46*	1.0		3.18	2.38
3 Productivity	.67*	.73*	1.0	4.29	2.60

n=55. *p<.01

Independent sample t-test – CPI impact on CPE

In order to study what is most important for a successful change process, an independent sample t-test was performed and is presented in table 3. This was made as a more exploratory test to identify the value of each CPI item.

The result indicates that 20 out of the 25 items had a statistically significant mean value difference between the “good” and the “bad” processes based on good processes defined as $CPE \geq 8.0$ and bad processes as $CPE \leq 5.0$. Out of these, 6 of the items had a mean value difference bigger than 4.0. A difference between 3.0 and 4.0 was the result for 5 items, and a total of 19 out of the 25 had a mean value difference bigger than 2.0.

Table 3. Mean value comparison between “good” processes ($CPI \geq 8.0$) and “bad” processes ($CPI \leq 5.0$) in relation to CPI items. Items in order of highest difference.

CPI item	Good (n=16)	Bad (n=14)	Diff	t-test
13. There was a transparency in decisions and causes (F)	8.75	3.36	5.39	8.33*
23. People felt that they were part of a winning team and that the change would make them stronger (S)	8.19	3.43	4.76	5.90*
12. There was a clear and frequent communication of time plans, status, problems and action plans (C)	7.69	4.57	4.74	5.84*
19. People felt that they had the information they needed (C)	7.88	3.14	4.73	9.54*
14. There were common work-shops and cooperation during the process (R)	8.56	4.29	4.28	4.83*

20. People were convinced about the value of the steps in the process and the level of control (A)	7.94	3.93	4.01	5.96*
16. People were convinced that nothing was held secret or that hidden agendas were used in the communication (C)	7.75	3.86	3.89	4.95*
17. People felt that everyone was treated fair during the process (F)	7.75	4.07	3.68	6.64*
21. People were convinced that the purpose of the change was to make it better for as many as possible (F)	8.50	4.86	3.64	4.08*
2. People understood that if we did not change, that would lead to insecurity and unclarity (C)	7.69	4.57	3.12	3.48*
25. People felt that everyone was in this together to make it happen (R)	7.56	4.50	3.06	4.26*
9. People had an anticipation of a higher degree of belonging and team spirit when the change was ready (R)	6.81	3.93	2.88	3.45*
11. There was a possibility for individual adjustments and improvements during the process (A)	6.50	3.71	2.79	3.01*
15. People were actively used as experts within their areas during the process (S)	7.44	4.71	2.72	2.93*
24. People were convinced that a common team effort was needed to drive the change (R)	8.63	6.00	2.62	3.54*
22. People were convinced about their own contribution and value in order to make the change work (S)	7.38	5.14	2.23	2.44*
7. People had an anticipation of a higher degree of clarity when the change was ready (C)	7.94	5.71	2.22	2.36*
1. People understood that if we did not change, that would lead to less freedom (A)	6.75	4.64	2.11	2.10*
18. People felt that they had the mandate to make their own decisions during the process (A)	5.19	3.14	2.04	2.52*
4. People understood that if we did not change, that would lead to conflicts within the team (R)	5.63	3.93	1.70	2.24*
5. People understood that if we did not change, that would lead to lower status. (S)	5.56	4.07	1.49	1.56
3. People understood that if we did not change, that would lead to injustice (F)	4.81	3.36	1.46	1.45
8. People had an anticipation of a higher degree of fairness when the change was ready (F)	6.19	5.00	1.19	1.36
6. People had an anticipation of a higher degree of autonomy when the change was ready (A)	5.63	4.57	1.05	1.12
10. People had an anticipation of a higher degree of status/importance when the change was ready (S)	5.69	4.64	1.04	1.23

*p<0.05

Multiple regression analysis – SCARF factor impact on CPE

In order to study whether the SCARF factors could predict Change Process Efficiency, a multiple regression analysis was performed and is presented in table 4.

The result indicates that CPE was predicted by Certainty ($\beta=.69, p<.05$) the correlation is positive indicating that a high degree of certainty is connected to a high degree of Change Process Efficiency. None of the other factors were statistically affecting CPE. In total, the SCARF factors explained 50% of the variance in Change Process Efficiency.

Table 4. Effects of SCARF on Change Process Efficiency (standardized coefficients, beta)

Predictor	CPE	VIF
Status	-.09	4.1
Certainty	.69*	3.7
Autonomy	-.25	4.1
Relatedness	.06	4.0
Fairness	.29	4.1
R ²	.54	
R ² Adjusted	.50	

* $p<.05$. $n=55$

No data with standard residuals < -3.3 or > 3.3 ($-3.231, 2.113$) existed, indicating no outliers in the data.

The correlations presented in table 1 shows statistically significant correlations between the Change Process Efficiency and all SCARF factors individually ($(Status =.47, Certainty =.71, Autonomy =.48, Relatedness =.53, Fairness =.64, p<.0005)$).

Discussion

This paper had an exploratory purpose rather than testing a specified hypothesis. This was divided into three questions

- i) Does an increased level of stress negatively impact the productivity and quality during a change process?
- ii) What are the differences in actions, perceptions and reactions between a “good” and a “bad” process?
- iii) Is the Change Process Efficiency related to how the SCARF factors (Status, Certainty, Autonomy, Relatedness, Fairness) have been affected by the change and which one of the factors are more important?

Comments on results

Stress impact on productivity and quality

According to Arnsten (2008), a brain under stress has an impaired c-system which would impact the organizations ability to deliver quality and be productive. Data shows statistically significant correlations between the perceived stress level and these two (*quality* $r=.46$ $p<.01$, *productivity* $r=.67$ $p<.01$) which is in line with the theory.

The reason that productivity seem to be more affected than quality may be the loyalty towards customer existing in many organizations. This was also mentioned in several interviews, that even if productivity went down and resistance and stress levels were high, the last thing that was allowed to be affected was the quality towards the customer.

Difference between “good” and “bad” processes

According to Rock (2009), a threat towards any of the SCARF factors would create a stress response which would in turn lower the Change Process Efficiency. These SCARF factors were measured with a total of 25 items. To support theory, these items should indicate a clear difference in their mean value comparison between “good” processes ($CPE \geq 8.0$) and “bad” processes ($CPE \leq 5.0$).

The result indicates that 20 out of the 25 items had a statistically significant mean value difference between the “good” and the “bad” processes, where 6 of the items had a mean value difference bigger than 4.0. Five of the items had a mean value difference between 3.0 and 4.0, and a total of 19 out of the 25 had a mean value difference bigger than 2.0.

SCARF impact on CPE

Based on discussed theories and as a hypothesis there should be a clear correlation between the change process impact on each SCARF factor, and the overall effect on the change process, CPE.

The result showed a strong and significant correlation between the SCARF factors combined and the Change Process Efficiency, CPE ($r=.74$ $p<.0001$). There was also a

strong and significant correlation between each individual factor and CPE (*Status* = .47, *Certainty* = .71, *Autonomy* = .48, *Relatedness* = .53, *Fairness* = .64, $p < .0005$).

The multiple regression indicates that CPE was predicted by Certainty ($\beta = .69$, $p < .05$) the correlation is positive indicating that a high degree of certainty predicts a high degree of Change Process Efficiency. None of the other factors were statistically significant as predictors for CPE. In total, the SCARF factors explained 50% of the variance in Change Process Efficiency. The multiple regression analysis also indicated that Certainty is the most important factor in order to predict the outcome of CPE, where 50 % of the variance in CPE is possible to explain by the variance in Certainty alone. According to how Certainty was defined by its CPI items.

Limitations

Asking for two examples of processes from each respondent made it possible for each respondent to identify the differences between their good and bad processes. However, this may also have caused some problems with inter reliability among raters.

The choice of using interviews instead of self-reported questionnaires made it possible for the researcher to clarify questions and also ensure that the respondents kept the broader perspective of how people reacted and acted. The challenge to reliability is in this case to ensure that the respondent is not guided in his/her answer.

The respondents had to put themselves into the shoes of all the people affected by the change. This is a clear limitation and threat to reliability since such judgement is easily clouded by personal beliefs and lack of understanding other's reactions. This may especially be tricky when large groups of people are affected. Some changes were also from a number of years back which may have affected the ability to correctly remember details.

A total of 55 processes were examined which is on the low side for the multiple regression analysis. The sample size should according to Tabachnick and Fidell (2006) (referred to in Borg and Westerlund, 2012), be $N \geq 50 + 8 * m$ ($m = \text{number of predictors}$), which in this case requires an N equal to 90.

The intercorrelations between the different SCARF factors were high, .73 to .82, which is one reason why the multiple regression analysis became so dominant by only one factor. The items are covering important aspects but not statistically separate areas, something also shown in a quick factor analysis (not covered in this report).

VIF was below 5 for all factors which indicates an acceptable intercorrelation between the factors. This is however still quite high and can be an explanation to why only certainty becomes statistically significant.

No Bonferroni correction was made for the t-test since each item was considered a separate unit for that particular analysis.

The questionnaire was new and developed by the author and needs further testing, development and factor analysis to ensure that the items included can be correctly divided into the five factors, SCARF, Status, Certainty, Autonomy, Relatedness and Fairness. This would increase the validity of the report. A bigger sample is needed in

order to make a valid factor analysis. According to Tabachnick and Fidell N=90 would be required for a correct five-factor analysis.

Implications for research

The area of change management has been well researched as well as the impact of stress on productivity and organizational efficiency. The brain's response to threats, physical as well as social, is also an area of intense research. The purpose of this report was to add to the combination of the two and connect neuroscience research with the more traditional change management research. The rationale for this being a perceived increased interest from practitioners in understanding the fundamentals behind human behaviors i.e. how the brain works, the logic behind. It may be important to note that most practitioners in the industry have very little formal education in psychology and behavior theories. Instead, many managers come from a natural science or economic science background.

The area needs more research in order to see if the SCARF factors are the valid ones for identifying threats to the brain and if so, how to measure those in an efficient way in a change process. The result from this report indicates that more work needs to be done in order to find the right measurements and items. One of the problems was probably that some items reflect activities performed by management e.g. communication, workshops and how people are used as experts. These activities may affect many of the SCARF factors at the same time. Other items are covering actions from management like transparency and allowing for personal adjustments. These may also affect several of the SCARF factors.

Future research would benefit from a further development of the questionnaire and factor analysis in order to create a better, complete and valid questionnaire.

Implications for practitioners

By looking at the CPI items with the highest difference between "good" and "bad" processes, an indication of important areas to consider in a change can be extracted. See table 5.

Table 5. The items with the highest difference between "good" and "bad" processes (diff > 3.0)

Factor	CPI
Status	People felt that they were part of a winning team and that the change would make them stronger
Certainty	There was a clear and frequent communication of time plans, status, problems and action plans People felt that they had the information they needed People were convinced that nothing was held secret or that hidden agendas were used in the communication

	People understood that if we did not change, that would lead to insecurity and unclarity
Autonomy	People were convinced about the value of the steps in the process and the level of control
Relatedness	There were common work-shops and cooperation during the process People felt that everyone was in this together to make it happen
Fairness	There was a transparency in decisions and reasons People felt that everyone was treated fair during the process People were convinced that the purpose of the change was to make it better for as many as possible

A suggested combination of these into a number of areas of focus for practitioners is:

Create a powerful WHY - Make people feel part of a winning team. Make them understand that the change will make them even stronger and the purpose is to make it better for as many as possible. Make them understand that if change is not made it will lead to insecurity and unclarity.

Build trust - Be transparent in decisions and the reasoning behind, don't keep anything secret or play with hidden agendas. Treat everyone fair during the process.

Communicate - Make sure there is a frequent communication of time plans, status, problems and action plans. Be clear about how the process is run, what steps are made and how each step is performed. Give people as much information as possible.

Involve - Involve everyone in work-shops and different types of cooperation during the process.

Conclusions

The change processes examined in this study were very different in character, from smaller organizational changes to large implementations of new business systems. There was also a wide spread in type of organizations and their line of business. Despite all the differences it is interesting to see that the same factors were considered stressful and differed the good processes from the bad. This shows the importance of how a change process is performed independently of what the change is about or the type of organization.

The conclusion is that the areas of Change Management and Change Processes are of high importance since identifying the most important factors may lead to driving change processes in a more efficient way.

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Appendix 1 - CPI items and relation to SCARF

Question	SCARF
1. People understood that if we did <u>not</u> change, that would lead to less freedom	A
2. People understood that if we did <u>not</u> change, that would lead to insecurity and unclarity	C
3. People understood that if we did <u>not</u> change, that would lead to injustice	F
4. People understood that if we did <u>not</u> change, that would lead to conflicts within the team	R
5. People understood that if we did <u>not</u> change, that would lead to lower status.	S
6. People had an anticipation of a higher degree of autonomy when the change was ready	A
7. People had an anticipation of a higher degree of clarity when the change was ready	C
8. People had an anticipation of a higher degree of fairness when the change was ready	F
9. People had an anticipation of a higher degree of belonging and team spirit when the change was ready	R
10. People had an anticipation of a higher degree of status/importance when the change was ready	S
11. There was a possibility for individual adjustments and improvements during the process	A
12. There was a clear and frequent communication of time plans, status, problems and action plans	C
13. There was a transparency in decisions and reasons	F
14. There were common work-shops and cooperation during the process	R
15. People were actively used as experts within their areas during the process	S
16. People were convinced that nothing was held secret or that hidden agendas existed	C
17. People felt that everyone was treated fair during the process	F
18. People felt that they had the mandate to make their own decisions during the process	A
19. People felt that they had the information they needed	C
20. People were convinced about the value of the steps in the process and the level of control	A
21. People were convinced that the purpose of the change was to make it better for as many as possible	F
22. People were convinced about their own contribution and value in order to make the change work	S
23. People felt that they were part of a winning team and that the change would make them stronger	S
24. People were convinced that a common team effort was needed to drive the change	R
25. People felt that everyone was in this together to make it happen	R