

Enhancing performance in manufacturing networks: Organizational learning as a means to increase performance.

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctoral of Business Administration.

by

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Abstract:

This research thesis offers an analysis of organizational learning as it unfolds in the context of performance management and a facilitator of strategic renewal within the LMIOP organization of Novo Nordisk. Organizational learning is, in the current context, recognized to consist of both exploitative and explorative activities for the organization to achieve a continued learning trajectory as suggested in Crossan et al's (1999) 4I model of organizational learning. Three action research cycles demonstrate how the organization balances the use of known knowledge from the legacy systems and the new knowledge created from learning inspired by external sources. Furthermore, the research cycles illustrate how the organization benefits from the temporary event-structures to create the social context for learning to occur. The research also shows the importance of artefacts and metaphors to help integrating individual's intuition in organizational learning.

The action research cycles have practical implications for the participating members of the organization and me as leader of the LMIOP organization. The work adds to academic knowledge via the empirical evidence of the linkage between organizational learning and increased organizational performance. The work also adds to practice as the knowledge from academia is applied in practice in a real-time change organization.

The research has taken place in the Danish pharmaceutical company Novo Nordisk during 2017 and 2018.

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Abbreviations:

The following list is representing abbreviations and company names used throughout the thesis.

Within Novo Nordisk:

Novo Nordisk : Danish pharmaceutical company.

Product Supply : The manufacturing leg of Novo Nordisk.

DFP, Diabetes Finished Products: Business area within Product Supply.

Device and Supply Chain Management: Business area within Product Supply.

LMIOP, Local Manufacturing and International Operations Projects:

Division within Device and Supply Chain Management.

DM1 – DM5: Danish Managers

RM1 – RM9: Russian managers

AM1 – AM9: Algerian managers

IM1: Iranian manager

CP1 – CP2: Centrally placed person (in Denmark).

cLEAN: Current LEAN. Meaning the latest version of the Novo Nordisk understanding of the performance improvement philosophy LEAN.

Novo Nordisk way: The main philosophy within Novo Nordisk.

PSPS: Product Supply Production System is a compilation of better practices within Product Supply.

Company names:

Bosch: German engineering and manufacturing company.

FL Smith: Danish engineering and manufacturing company of cement facilities.

Maserati: Italian car manufacturer.

MIT: Massachusetts Institute of Technology

Other abbreviations:

DBA: Doctor of Business Administration (used about the program).

Industry 4.0: A German concept related to technology development within the field of connectivity (human, machines and data).

Pc: Personal computer.

TPS: Toyota Production System. A system developed by the Japanese car manufacturer to support continuous improvements in manufacturing.

1.0 Introduction:

1.1 The situation

Novo Nordisk, the Danish medical manufacturer, has over the past decade gradually been faced with challenges from an external trend where an increasing number of countries are adopting a healthcare ambition requiring a local manufacturing presence. For example, a decade ago the Algerian government required manufacturers of medical products to establish local manufacturing to continue to sell their products. The new reality has required a response where the company could obtain first-mover advantage and at the same time maintain a lower level of complexity by influencing the governing bodies to focus on the least complex manufacturing processes. The changed environment requires a rethinking of the company's manufacturing policy where focus has been on large scale operation to reap the cost benefit of scale. Novo Nordisk's response has been articulated in a specific Local Manufacturing Strategy.

Compared to the large strategic manufacturing units, it is fair to say that the local manufacturing units negatively impact the gross margins due to the relative high cost per produced unit. Large strategic units have a better balance between operating cost and output volumes. A large manufacturing unit typically has five to six-times higher volumes output than the local manufacturing units and with a manning double of the level of the local manufacturing unit. This raised a significant challenge and the following problem which needed to be resolved:

How can an explosive increase in unit cost be avoided through more effective units?

Some of the immediate answers were linked to standardization and modularization, which can be suggested to be part of the existing legacy systems. Another part of the answer, however, was an explorative rethinking of the response to establishing and operating of local manufacturing units. I was strongly influenced by a general interest in performance management and through organizational learning. The idea is inspired from deGeus (1989) and Stata's (1989) argument that sustainable competitiveness can be achieved through organizational learning. Furthermore, I was inspired by watching the movie "Limitless", directed by Neil Burger, where the main character takes a drug that increases his ability to fully utilize his brain and consequently improves performance and lifestyle. This plot, built on the myth of ten percent use of the brain, created an interest in the higher utilization of the organizational "brain capacity" from increasing connections between the individual "organizational neurons". Hence, the idea of connecting the units in a network of "neurons" was created and further developed into the concept of the "virtual factory". I have, in this research context, defined the virtual factory as an operating network consisting of several smaller units scattered over large geographical areas covering North Africa, Middle East, and Russia.

1.2 The operation

The Local Manufacturing organization (LMIOP) is the subject of the research and currently employs six hundred individuals. The organization was created in April 2016 as a response to operating the local manufacturing units in North Africa, Middle East, South East Asia and Russia. LMIOP has part of the managerial and support functions placed in Denmark. As leader of the organization I have been focusing on how to operationalize the company's strategy on local manufacturing activities. My experience and interest in performance management can be argued to be based in an exploitative perspective within Novo Nordisk's strong performance culture and in my previous roles as leader of several of the company's large strategic manufacturing units. Performance management is an institutionalized part of the way we operate, and the holistic approach is reflected in the balanced scorecards.

The performance management system, called Product Supply Production System (PSPS), is inspired by the Toyota Production System (TPS) and the management principles described in *The Toyota Way* (Liker, 2004). The PSPS principles are based on assimilation of agreed better practices and standardization of processes across the network of large strategic manufacturing units. Thus, the performance management system focuses on exploiting current competences and systems to reduce variance and provide incremental improvements.

The PSPS has over the past ten years shown clear evidence of the effectiveness and gained a true legacy position (the PSPS booklet is now in 2nd edition). For example, it has led to increased output and lowered number of errors within the network of large strategic manufacturing units. However, we have primarily been focusing on the incremental improvements of existing structures, and it appears that we give more credence to exploitation as opposed to explorative learning (Schwandt, 1994). Matthews et al (2013) suggests that the exploitative thinking behind the PSPS' sharing of better practices and incremental improvements risk to reject long-term good strategies due to short-term unfavourable business cases. Furthermore, Macpherson and Jones (2008) suggest that challenging accepted assumptions within an organization requires a break from the accepted order, creating disorder before new assumptions are accepted. This provides a further guiding question for the research based on Matthews et al's (2013) suggestion that a conscious strategy was needed to drive explorative initiatives. What is the aim of the research is to consider how we can balance exploitative and explorative activities to develop our organizational learning more holistically.

I do not perceive the current strategy of sharing better practices as encouraging a search of knowledge outside the organization. I perceive that Product Supply and LMIOP tend to become blocked by the "not invented here" thinking and believing in that other businesses are less restricted and complex than ours. I have experienced how this dominant thinking has

prevented us from benefitting from learning from both outside and inside the company. From re-visiting the movie “Limitless” I realized the opportunities of increasing organizational intelligence from connections and in this perspective, it could be argued that my perception of the underutilization of internal explorative competences could limit assimilation of new knowledge. This creates a further dilemma that will guide the research:

How can we use the construct of organizational learning and integrate it within daily activities to act as leverage for increased performance?

I saw the opportunity to establish internal exploration based on the idea of the “virtual factory”. The idea seems supported through Thom-Otuya et al’s (2014) argument that newly established organizations creates a window of opportunity where the organization is best positioned for learning. This can be suggested to provide me with the perfect timing to apply my learning from the DBA program at the University of Liverpool into my practice. The purpose was to engage into action research to increase performance through organizational learning and consequently obtain mastery of strategic renewal.

1.3 The challenge

The phenomenon of interest starts with the desire to create a manufacturing organization where high performance can be obtained despite the lack of leverage from economy of scale. In this context I understand “performance” as completion of manufacturing related tasks, by applying learning and knowledge, measured against the current standards of reliability, completeness, cost, and speed of change (strategic renewal). The problem at hand would be to drive down operating costs through sustainable competitiveness achieved from organizational learning (deGeus, 1989; Stata, 1989). This perspective resonates with Crossan et al’s (1999) suggestion that the purpose of organizational learning is to support strategic renewal, which links well to the fast-changing local manufacturing environment. I envisioned the “virtual factory” becoming the common platform and experience from where the learning would be created in the connectivity between the manufacturing units and individuals. I see the “virtual factory” as an artefact, which by Shrivastava (1983) and Macpherson and Jones (2008) argue to be the common ground for learning and a facilitator of institutionalizing. Thus, in this thesis the “virtual factory” is considered as an organization that knows how to utilize partnerships outside of its boundaries to mobilize more knowledge than it owns.

The idea of a “virtual factory” as lever of increasing effectiveness seems consistent with Reinicke (2010) and Tamosiunaite’s (2011) definitions where virtual organizations are geographically distributed, bound by common interest, and necessitating the virtual space of interaction to achieve objectives. Handy (1995) suggests that virtual organizations have the flexibility to adapt to the fast changes in today’s business environment,

which seems to be the recipe for our future activities. The success of the virtual organizations is furthermore suggested to depend on the organization's learning culture (Handy, 1995). This resonates with my focus on creating strategic renewal through organizational learning.

The current research utilizes the "virtual factory" as platform for the investigations on organizational learning as driver of increased performance through the organizations ability to create and manage knowledge as means to obtain the capability of constant renewal. I suggest that this can be happening from learning through the connections made in the virtual organization and from the "virtual factory" as an artefact. The aim of the research is to create understanding of organizational learning and to put the organization in a position where we consciously utilize the "virtual factory" as vehicle to obtain improved performance across LMIOp. Hence, the thesis title can be articulated as below.

Enhancing performance in manufacturing networks: Organizational learning as a means to increase performance.

With the above-mentioned problems at hand the aim is to improve the current standards of reliability, cost, and ability to change, by sharing and creating knowledge in the social context of the "virtual factory". The overarching research question can be articulated as:

How can organizational learning (strategic renewal) be implemented within LMIOp to obtain increased performance seen as reduced unit cost resulting from reduced investment cost and increased manufacturing output?

My ambition is that exploitation of existing competences (PSPS better practices) and exploring new potential through organizational learning ("virtual factory") must co-exist under the theme of organizational ambidexterity.

The objective of the research is as such to leverage learning across LMIOp, and in this way the problem at hand is moved into the theoretical context of organizational learning.

1.4 Theoretical context

Organizational learning can be seen in association with organizational theory and is a well-established concept (Daft and Huber, 1987). As suggested by Keirnan (1993) learning has become the only viable alternative to corporate extinction, which can be seen as a bold statement but resonates with deGeus (1989) and State (1989) who suggest organizational learning as means to obtain sustainable competitiveness. Ellinger et al (2002) also acknowledge the positive correlation between organizational learning and performance increase but argue that the liaison is inadequately established. The practical problem of increasing performance from better utilization of

knowledge and knowledge creation can be suggested to contribute to the understanding of the liaison between organizational learning and performance increase. The empirical evidence from my research will be disclosed as part of the conclusion (section 7.0).

In the light of “Industry 4.0”, general discussions and academic papers (Brettel et al, 2014; Lee et al, 2014) it becomes more and more acknowledged that the combination of robotics and human intuition and creativity will be decisive for future competitiveness. This leads me to consider if organizational renewal can create a perspective on how we learn to explore these new opportunities. The planned appliance of a system of large interactive monitors across the organization with the purpose of creating transparency from the collected data and fast sharing of knowledge can be seen to fulfil such explorative thinking.

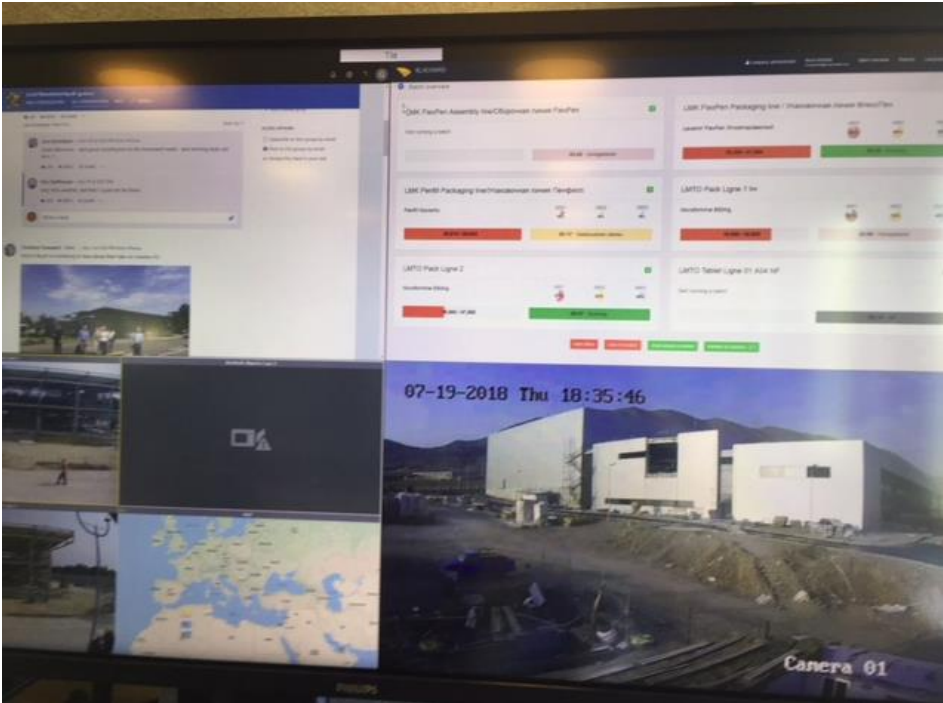


Figure 1 The overview of the “virtual factory”.

The organizations interest in the integration of virtual reality to improve design and testing of new facilities can also be suggested in line with exploration of Industry 4.0 opportunities. It can be argued that within today’s dominant performance management we focus on incremental behavioural changes, which are more a response to short-term environmental fluctuations (Schwandt, 1994) than the long-term sustainability (deGeus, 1989; State, 1989). And as suggested by Tippins and Sohi (2003) the benefits of using new technologies occurs when mediated by organizational learning. For LMIOP I see this as renewal of our way of operating. The renewal perspective is found described by Crossan et al (1999) and Macpherson and Jones (2008) who suggests strategic renewal as the outcome of organizational learning, which can be argued to be the sustainability perspective on performance management and the ability to

balance exploitative and explorative activities. The theoretical context of the problem can then be suggested to include the dilemma of short-term (exploitation) and long-term (exploration) focus as seen in Birkinshaw and Gibson's (2004) discussion of organizational ambidexterity.

1.5 Driving the change:

The research can be argued to take the form of evidence supported narrative of the change process. Greenwood and Levin (2007) suggests that knowledge is generated through conscious attempts to solve problems in practice. The need for LMIOP to create new ways of obtaining higher performance sets the context of practice where the learning through internal and external connections will become the driver of renewal. I will need to create structures where I trigger the internal exploration competency to avoid rejecting external knowledge (Hoang and Rothaermel, 2010). During the research I am addressing this subject through educational journeys, which are included in the action research cycle "Getting traction".

When I was investigating research methodologies I found that Coghlan and Brannick's (2010) reflections on action research was resonating with my situation. I see action research different from the more traditional research methodologies in the way that most observing methodologies can be argued being research on action (Coghlan and Brannick, 2010). Doing action research can also be seen different from other research methodologies in the way that the methodology involves the members of the investigated organization, which I will argue is a necessity to obtain a change or solve an organizationally-based problem. The approach has the advantage that I can utilize my knowledge of the organization as I am taking the role as leader, researcher, and interventionist. I can suggest that appliance of action research could be seen as a leadership principle as much as a research methodology. The inclusion of my own practice in the research was also leading to the choice of an auto-ethnography writing style where the narrative visibility of myself as member of the organization is clear to the reader. This perspective where the authors build on their own professional experience can be seen as controversial in the academic context (Denshire, 2013). However, in Coghlan and Brannick's (2010) inclusion of intended self-study, as part of action research I cannot exclude myself from the problem. Hence, the reflexive and self-observing element as suggested by Anderson (2006) becomes important in the auto-ethnographic context where I constantly need to remind myself about my different roles and my integrity as researcher.

It can be argued that the combination of action research and the auto-ethnographic writing style reflects the practitioner's engagement in applied academic literature and in this way resonate with the requirements to the DBA as described by the University of Liverpool in the requirements of a research degree (Liverpool, 2015). While I will be focusing on organizational learning I will also be following a personal learning trajectory, which will impact my future management practice.

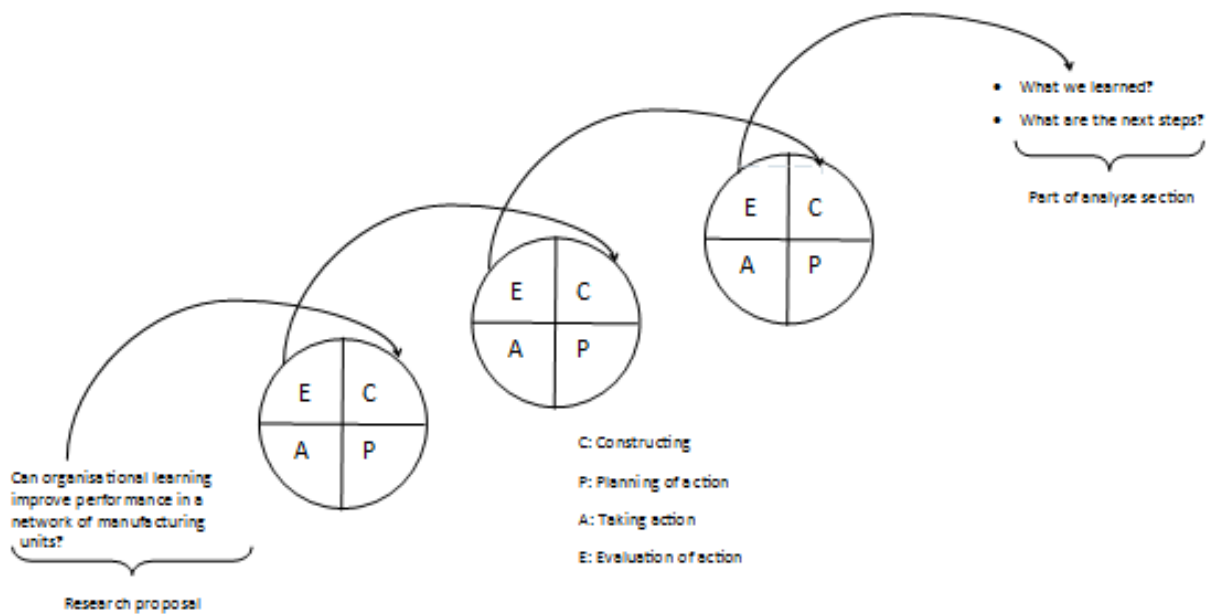


Figure 2 The spiralling progress of action research

The choice of traditional action research means that the research will take an iterative spiralling path driven by the applied action cycles (fig. 2). The process also involves the individuals from the organization being investigated and a risk embedded in the system is that due to the unpredictability of human behaviour, the introduced actions might come out with other results than expected. My own involvement in the change process could risk driving the focus towards the implementation of the “virtual factory” more than towards the real objective of creating learning. It will be important that my choice of methodologies is reflecting the learning perspective and that the evaluation phases focus on the learning as means to strategic renewal, and not focusing on traction as means of implementation of the structure.

1.6 Plan of the thesis

The thesis is divided into seven parts and follows the iterative flow, which is the nature of action research.

Chapter one, “Introduction”, introduces the organization being subject of the research as well as the problem at hand. The chapter disclose the motivation and basic thinking that encouraged me to start the research and the change process.

Chapter two, “Literature review”, deals with the landscape of insight, which can be found in the academic literature. The different sections within the chapter create a perspective on organizational learning seen from different angles and theories. The main constructs within the discipline of

organizational learning is discussed and framed in a context related to the challenge within the investigated organization. The literature review can be considered as the first research cycle where I from the literature create knowledge about the full landscape but also find the indications of how I can organize the progress of my investigations. The literature review contains the fundamental knowledge on organizational learning and has as such been the foundation for my research.

Chapter three, “Methodology”, deals with the issue of doing research within my own organization. In the chapter I have outlined the research cycles and the elements within the four quadrants: Constructing, Planning action, Taking action, Evaluating action. The chapter includes a detailed description of my data collection methods and how I intent to analyse the data from each method used. In the description of the research methodology I also describe whom from the organization I will involve in the research, and how the participation is intended to take place, i.e. a description of the search conferences, and learning sets, which I perceive as the major catalysts to drive the desired change.

Chapter four, five and six, “Research findings”, explores the actions from the research cycles, and raises the questions, “What is going on?”, and “What is next?”. The chapter deals with the analysis of the compiled research data and will try to answer the question if the current idea of creating a “virtual factory” is a viable way of leveraging knowledge creation and what the next steps must be to ensure sustainability of the concept. Hence it is an evaluation of the traction within the “virtual factory” as catalyst of organizational learning.

Chapter seven, “Conclusion”, is the final overview of the research findings and perspectives related to the original challenge. The chapter will create the liaison between the changes within the organization and the obtained performance increase. Furthermore, the chapter contains a reflection on my own journey as insider researcher, and finally an up-date on how the change process has moved forward since the research ended.

2.0 Literature review.

The term “organizational learning” as a concept seems generally accepted, but the diversity of constructs within the literature makes it difficult to really pinpoint a clear definition. Within the frame of the literature review I will first elaborate on the definitions related to organizational learning, and then I will look at the dominant discourses within the discipline, hereunder the question if organizations can learn, and lastly, I will introduce three learning schools. Consequently, my objective is to frame organizational learning as a possible solution to the earlier described problem.

2.1 The aerial picture from forty thousand feet

Crossan et al (2011) suggests that the discipline of organizational learning is a grouping of constructs without solid theory as foundation. However, others also recognized that organizational learning is strategically important to obtain sustainable competitiveness (deGeus, 1988; Stata, 1989), which resonates with the purpose of changes to my organization. The dilemma seems consistent with Garvin’s (1993) suggestion that, although researchers have studied organizational learning for a long time, there exists still considerable disagreements on definitions, which makes it relevant to create an “aerial picture” of the landscape.

2.1.1 Emerging patterns

The academic literature on organizational learning is found mainly to be driven from the Western world. Few articles are seen from other parts of the academic world, although initially Nonaka (1991), and Nonaka and Takeuchi (1995) have provided substantial literature covering organizational learning from perspectives outside the Western world. In recent years, Hong (Hong et al, 2017) has been publishing papers on learning in the Asian context and, echoing my own observations, has referred to the literature on organizational learning as ethnocentric. The primary focus on Western business models and procedures is also disclosed in a list of the most frequently referenced authors like Argyris (1976, 1977), Senge (1990), Crossan et al (1999), Huber (1991), Leavitt (2011), Easterby-Smith (1997), and Nonaka (1991). Only Nonaka (1991) represents the non-Western world, and I can argue that Nonaka and Takeuchi, with their background in the Western academic world, will be influenced by this dominant curriculum and literature. The ethnocentric discovery was important since my research is spanning over several geographical separated cultures.

I discovered a pattern in the list of frequently referenced authors, which I find necessary to disclose for a better understanding of the literature review. The ethnocentric perspective has already been mentioned, and I also recognize a grouping of action driven research, which has a more commercial character (Argyris, Senge, and Nonaka). The group takes a direction towards

creating a change by proposing frameworks (Single- and Double loop learning, The Fifth Discipline, Self-organizing teams, and The new product development game) and in this way becomes proactive by focusing on application. I see Senge's (1990) and Nonaka's (1991) writing directed to the practitioner as "templates" for how to create a learning organization. The observation resonates with Easterby-Smith (1997) suggesting that the literature from the early 1990s has taken an action-orientation perspective in which learning is maximized. However, I do not find any break-through thinking. For example, Senge's (1990) publication, which can be argued to build on several existing constructs and especially the systems thinking, which was first seen in the middle of the 1950s in Forrester's work at MIT (Aronson, 1996). This type of literature can be considered to contribute more to organizational learning than traditional academic papers, since the knowledge is seen acquired by practitioners. For example, Senge's (1990) successful publication "The Fifth Discipline", had in 2006 been printed in more than one million copies.

In contrast to the action orientation stands the traditional observer-based authors with focus on analysis, synthesis, and reviews of existing literature. The observing group could be suggested to have less impact in bridging into practice since the viewpoints do not pan out in practical applicable frameworks and popular literature. For example, Crossan et al's (2011) reflections on if the theory on organizational learning is sufficiently strong, might be important in the academic perspective, but is not the type of articles reaching the practitioners. Shrivastava's (1987) suggests that the usefulness of strategic management research lies in the ability to provide rationale for decisions and actions in organizations. Practitioners are interested in research results directly relevant and operational to their organization's objectives (Shrivastava, 1987). However, Shrivastava's (1987) criteria for usefulness can be criticized for solely taking a practice perspective. Nightingale (1998) suggests that practitioners learn from the past and that the scientific knowledge goes in the opposite direction with known starting conditions and towards unknown end results (Nightingale, 1998). The approach will foster ground-breaking new knowledge but does not seem to relate to the observing role, or the reflections on existing literature, as seen in the case of Crossan et al (2011). Nightingale (1998) can be suggested to criticize the academic literature for not being sufficiently timely and discussing past research, which could be seen to provide "expired knowledge" to the practitioners.

Thus, I can argue that a few of the most referenced authors within the academic literature are influencing the world of business and driving a dominant discourse with a focus on finding solutions to problems predominantly within Western business models.

2.1.2 Development of concepts

Despite that organizational learning has been investigated over a prolonged period (Garvin, 1993), there seems to be an increasing number of new articles over the past forty years. Easterby-Smith (1997) suggests that, in the year 1993 the number of academic papers published on the topic equals what was published during the whole of the 1980s. Crossan and Guatto (1996) found in a similar study that in 1970 there were nineteen studies on organizational learning, in 1980 this number had increased to fifty, and during the first four years in the 1990s there were 184 studies on the topic. My own investigation based on a small scale of data suggests that this development continued into the 2000s. I have categorized approximately two hundred references within the decade of publishing. The investigation shows that from the 1970s there seems to be an increasing interest from the discipline of psychology and further increasing interest during the 1980's and early 2000s (see fig. 3).

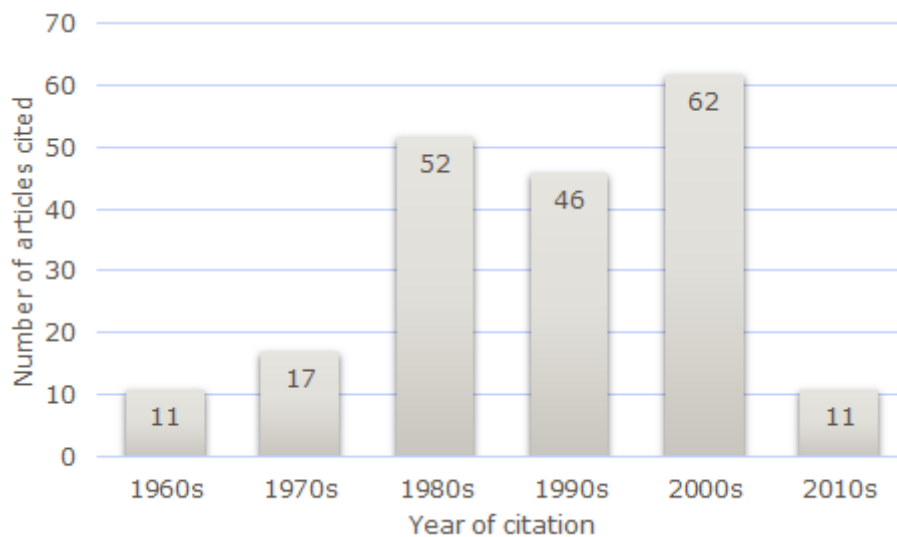


Figure 3 Development in academic literature

Data for the later years does not yet reveal any evidence of if the trend is continuing. But a quick look at the literature on bookshelves in the airport book stores could indicate a continuing trend and especially the literature written from an auto-ethnographic or consulting perspective. The data content leads me to consider that an unmet need existed within practice.

Ellstrom, (2010) and Grant (1996) suggest that the increasing interest within organizational learning is driven by globalization during the 1980s, where organizational experience fell victim of the increasing competition and therefore fast changes became a survival skill (Ortenblad, 2002; Senge, 1990). The period also represented a shift in the workforce, going from the goods producing to the creation of a service sector. However, manufacturing out-put was maintained due to increasing efficiency by the introduction of new technologies (Plunkert, 1990), a situation which might have called for new learning models. Another potentially influencing development in the 1980s was the establishment of Local Area Networks and the widespread use of PCs resulting in more focus on knowledge workers. The increased ease of

data flow could have directed business leaders to look for strategies where the knowledge workers become a decisive competency. Could the research trend be the organizational response to the technological development? Or is the development, as suggested by Crossan et al (2011), more a “mushrooming” of ideas and constructs ill-founded in solid theory. The exponential development in the literature over the past decades (fig. 3) could be argued to support Crossan et al’s concerns that the number of new constructs might just add on to the complexity of defining organizational learning. However, another answer could be found in the technological development. I could suggest that organizational learning has undergone an evolution in synchronization with the technological development (fig. 4).

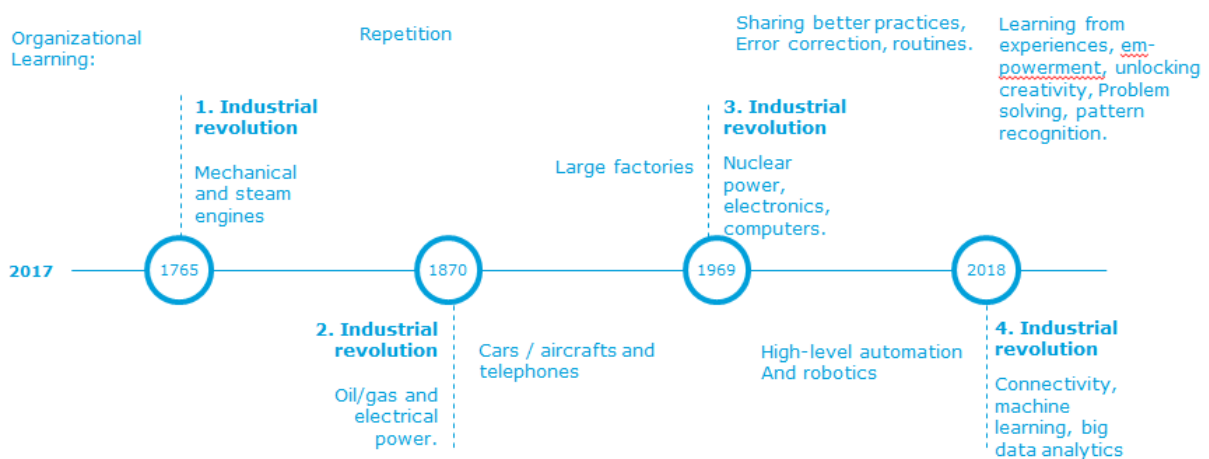


Figure 4 The four industrial revolutions and the dominant learning concepts.

The figure shows that during the period of Taylorism and Fordism, repetitive tasks dominated in large factories as one of the cornerstones in scientific management (Taylor, 1998). Later in the third industrial revolution the exploitative improvement of repetitive tasks was refined to include error correction as seen by the introduction of Argyris’ single- and double-loop learning in the 1970s and later in Crossan et al’s (1999) feedback model. During the 1980s, the definitions on organizational learning reflects the process of improving actions through knowledge and understanding (Fiol and Lyles, 1985), encoding inferences from history into routines guiding behaviours (Leavitt and March, 1988), and that learning occurs from sharing of insights and knowledge built on common experiences (Stata, 1989). This leads me to consider that the learning models might have shifted from a mainly cognitive focus to also include the interaction between individuals over the two decades.

In the 1990s perspective organizational learning could be defined as a change of behaviours through the processing of information (Huber, 1991). An opportunity generated by the technology, as Pc’s became a commodity. Earlier this processing had been cumbersome due to the cognitive limitations (March and Olsen, 1975). In the 1990s the definitions seem to create a more proactive picture, which echoes Sharmer’s (2009) focus on our

active search for past lessons learned and patterns that we recognize as a means to face the challenges of an uncertain future. The trend seems moving beyond individual learning and towards involving social interaction.

Today, during the fourth industrial revolution I suggest that we are focusing on unlocking the creativity and problem solving to be able to face new unknown challenges. The machine has survived the changing times and gone through an evolution throughout the four industrial revolutions and has incrementally become more advanced and automated. The combination of the computer/robotics and the human creativity is what today's focus on Industry 4.0¹ is all about (Keywell, 2017). Organizational learning has moved towards not only expanding knowledge through interactions in a social context, but now including the assimilation of "knowledge" from computers (for example, IBM's Watson).

I can suggest that a similar and parallel evolution has happened to the concept of organizational learning. Learning by repetition is still applied and error correction feed-back finds its way into our exploitative frames (for example, Novo Nordisk's appliance of better practices as part of the PSPS² concept). We are also starting to look for learning that makes the organizations not only capable of recognizing known patterns, but through analysis and creativity becoming capable to understand unknown challenges. I could argue that as well as the industry has not rejected earlier inventions (machines are just becoming more advanced), the same can be said about the dominant learning principles. We have moved from repetition to pattern recognition while maintaining the basic principles. Shipton (2006) suggests that the literature has been developing through re-conceptualizing basic assumptions and building on existing ideas. The development can be suggested to follow the phases of strategic renewal as conceptually described by Crossan et al (1999), March (1991), and Macpherson and Jones (2008), and in this way organizational learning has remained sustainable as a concept over the past century.

2.2 Definitions of organizational learning

Three concepts stood out in the initial literature review: Organizational learning, Learning organizations, and Knowledge management. I will in the following sections discuss the definitions and, in this way, frame the scope of the thesis.

¹ The fourth industrial revolution or Industry 4.0 is defined as the period of connectivity. The previous revolutions covering mechanization, mass production, automation (early robotics) will now be combined with big data analyses and the human creativity. Industry 4.0 is the term used within the European industry to categorize the un-going and expected changes. The interest and the terms seem not yet to have reached the academic literature; a quick search shows no current results.

² PSPS means Product Supply Production System and is a compilation of better practices intended to serve as inspiration to improvement activities across the manufacturing network.

2.2.1 Why the confusion?

Organizational learning develops when an organization includes certain qualities requiring learning. Crossan et al (1999) suggest organizational learning as a principal means for organizations to create strategic renewal. The perspective seems supported by Garvin (1993), suggesting the learning organization as an organization skilled at creating, acquiring, and transferring knowledge, and at the same time modifying behaviours to reflect the obtained insights. Similar traits are referenced by Macpherson and Jones (2008), suggesting that challenging accepted assumptions and a break with accepted order are necessary qualities, and that social practices are needed for learning to result in strategic renewal. Hence, organizational learning and learning organizations are different elements, but with strategic renewal as the common denominator or outcome. This would lead me to consider that organizational learning is the means for the learning organization and creating the basis for strategic renewal to happen.

The above example shows how cognition and action through the literature review has created new knowledge and been leading me through learning-in-action. Crossan et al (1999) argues that this linking is the difference between organizational learning and knowledge management. Hence, knowledge management can be seen existing as a second stream parallel to organizational learning with a focus on cognition. In this way, the construct does not capture the cycles of action and acquisition of knowledge. However, it is commonly accepted that cognition is part of organizational learning. Also, King (2009) argues for a linkage in his suggestion of complementary constructs related to planning, organizing, motivating, controlling of people, processes, and systems to ensure effective deployment of the knowledge assets. The argumentation for a link or complementary constructs resonates with my own motivation to start the research on organizational learning. My own organizations inability to draw on the full potential of the knowledge possessed came clear to me from watching the movie *Limitless* directed by Neil Burger, featuring the main character's enhanced mental acuity through an external input of a drug substance, increasing the connections between the brain neurons and making already acquired knowledge immediately available. Is this learning? I will consider this as intelligence at the individual level and catalyst to create thinking about learning as performance leverage within my organization. Following Crossan et al's (1999) argumentation the sharing or availability of knowledge is at the organizational level and is thus recognized as collective learning. This means that for organizational learning to occur, knowledge must be developed and shared across the company, and embedded in new practices.

This leads me to consider that organizational learning is then the goal of knowledge management (King, 2009) and that organizational learning comes alive in the social interaction of the learning organization. Finally, the

outcome is the phenomenon of strategic renewal (Macpherson and Jones, 2008) (fig.5).

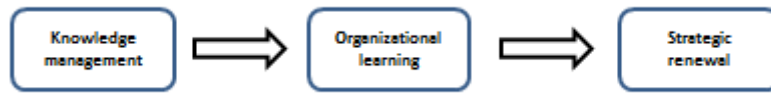


Figure 5 Strategic renewal is the outcome of successful learning.

This conceptualization of the relationships suggests that focusing primarily on organizational learning and treating the learning organization and knowledge management as separate and subordinate concepts is a legitimate strategy to follow in the further work on the thesis. Organizational learning inevitably involves knowledge management, but the type of organization where it occurs can be described as a learning organization (Shipton, 2006). The discussed constructs lead me to consider my definition on organizational learning as pragmatic by focusing on the outcome as means to improve operational performance in my organization.

2.3 Dominant discourses within the literature

The investigation on definitions, insights to the increasing variations over the later decades, and a reflection on the frequently cited authors, has created an interest in investigating the dominant discourses. The insights shall help me to understand tendencies, main drivers and assumptions in the development of the constructs. I will in the following section investigate four main discourses and one potential discourse.

2.3.1 Necessity is the mother of invention

I have in the preliminary literature review argued that the increasing academic interest in organizational learning has been driven by a need from practice. Furthermore, Ortenblad (2002) suggests that survival has been the objective. This “burning platform” is echoed in much of the literature and is creating a focus on adaptive learning models. For example, Nonaka and Takeuchi’s (1990) focus on the articulation of tacit knowledge, and Nelson and Winter’s (1982) focus on routine and repetition. I can argue that the adaptive learning and refining of what is already known can only ensure the survival in the short-term perspective. Examples could be found within the type writer and photography industry, which today is non-existing or dramatically reduced.

Nonaka and Takeuchi (1990) are addressing the longer perspectives in their focus on product innovation (*The new product development game*, 1986), and provide an example of balancing short- and long-term survival. The self-preservation, which is built into the survival as motivator could be argued to be a result of cognitive learning, requiring an inner motivation. It is from our

cognitive perception and imagination that we store and organize impressions, which later will become part of the recognition of patterns and situations leading to action and to avoid what previously have turned out to be harmful. In Crossan et al (1999) 4I learning framework, this type of behaviour is referred to as intuition and interpretation, and are traits related to individuals. I will in the context of organizational learning define intuition as the result of an intuiting phase where information is processed in a complex non-sequential way, which dependent on the context can be suggested as rapid and sub-conscious (Akinci and Sadler-Smith, 2018; Hodgekinson et al, 2008). Further, Jenkin (2013) suggests the information foraging process as closely linked with intuiting and in the individual phase of learning. This can be seen as information seeking based on early explorative goals and as such a different process than intuiting in the sense of being rational and evolutionary. That the two different processes co-exist suggests that it is too simplistic to indicate intuiting as the only starting point of organizational learning as seen in Crossan et al's (1999) 4I model (see figure 9). Organizations do not possess intuition and interpretations (Crossan et al, 1999). Macpherson et al (2004) suggest that the reason for organizations to create innovative responses to changes in the environment is the cognitive ability and capabilities in terms of organizational learning and can be seen as a core competence. However, it is the same phenomenon blocking our imagination when it comes to "thinking the unthinkable". Macpherson et al's (2004) suggests that dynamic capabilities are about adapting procedures in a planned fashion and as such not a response to an immediate survival situation. Organizational learning becomes a pattern of collective activities through which modifications are systematically generated in the pursuit of improved effectiveness (Zollo and Winther, 2002). The modifications can be the feedback function as suggested by Crossan et al (1999), but also a planned adaptation (Macpherson et al, 2004), is suggested to be an explorative feedforward learning model.

A dominant discourse on survival as a driver of learning can be the motivation for academia to respond to needs within practice rather than utilizing the "academic room" for explorative thinking or as Crossan et al (2011) suggests, strengthening the theory on organizational learning. Morgan (2006) suggests that the literature is trying to justify and rationalize on changes in behaviour that often seem non-rational. It can be argued that the literature is following a feedback learning model and mostly becomes exploitative. The perceived need for survival in the fast-changing environment drives a fast response in the creation of constructs explaining the phenomenon and possible solutions. Morgan (2006) argues that this "firefighting" result in that organizational patterns and constructs give way for new without a rational reason. Huczynski (2006) suggests that we risk creating new answers to old questions based on the feedback, and eventually exhausting the constructs. However, I also see these corrections as the nature of feedback learning models, refining the models without creating any radical new knowledge. I find that my perspective resonates with Nightingale's (1998) criticism of not providing new knowledge to the practitioners.

Macpherson et al (2004) suggest that the term “survival” does not need to be seen in a short-term crisis perspective but should also be seen in the sustainability perspective. Both the feedback and feedforward learning models must be taken into a combined equation. However, March (1991) suggests that exploitation and exploration are two fundamentally different learning activities dividing the organization’s attention and resources. I will need to understand these activities to strike the balance required in my practice.

2.3.2 Balancing short-term survival and long-term sustainability

The resource dilemma related to short-term and long-term activities is well known and described within the literature. The number of articles mentioning the dilemma leads me to consider that the theme is “the” dominant discourse within organizational learning. Especially March (1991), Crossan et al (2011), Bapuji and Crossan (2004), Birkinshaw and Gibson (2004) and Birkinshaw and Gupta (2013) have been contributing to the discourse, often under the headline of organizational ambidexterity.

The tension can be argued to be the nature of exploitative and explorative activities. The exploitative activity creates a more recognizable link between cause and effect. Furthermore, Argyris (1976) is arguing that exploitation is the dominant interaction between individuals (single-loop learning). March (1991) argues that internal incentives are often based on short-term results to ensure a clear link between activity and reward, and in this way supports exploitative behaviours. March (1991) goes as far as to suggest, that “if” exploration exist it will be due to special incentives in the environment. The explorative activities often have a delay in the time between the action and the consequences, making the identification of organizational learning problematic.

Why is it that we cannot link activities to consequences? Senge (1990) suggest that we learn best from experiences, but never really experience the consequences of many of our decisions. We tend to look at cause and effect as relatively near to each other, which makes it possible to link the two ends. However, Crossan et al (1999) is suggesting that in the fast-changing environment the learning, which has been institutionalized might risk no longer to fit the context where it is exploited and the organization risk operating according to expired knowledge. For example, the LMIOP organization was established where structures aimed to serve a reality without much pressure on establishing local manufacturing units. The reality has now turned out differently and exploiting by doing “just enough” is no longer accepted by the different nations. As response to the changes in the environment the strategic outlook for the LMIOP organization needed to change. The explorative operation is seen as uncomfortable for the organization since it can be difficult to define measures for the impact in a short-term perspective. Exploration does not fit into the balanced scorecard

that has a yearly focus. I will argue that the change has created a structural ambiguity, which is expressed through the constant search for “handles” we know and of which we are familiar with the consequences.

Macpherson et al (2004) acknowledge the balancing of creating new capabilities while ensuring the generation of an income as seen in the example from Novo Nordisk, suggesting that it is about adapting procedures in a planned fashion rather than as spontaneous responses to occurring situations. This balance can be argued to be the essence of strategic renewal, which Crossan et al (1999) and March (1991) argue is requiring that the organization explore and learn new ways while still exploiting what is already known. This means, in the LMIOP perspective, that we continue exploiting based on the legacy systems while we are implementing the explorative “virtual factory” concept. So, why is it then so difficult when it seems that we are dealing with internal systems? One answer can be the institutionalized short-term objectives in the organizational structures. For example, the Mercer International Position Evaluation (IPE), which is claimed to be business driven and evaluate positions relative contribution to the overall result and in this way the value of the position to the organization. However, the system is structured in a way that activities contributing to daily profit (for example, daily manufacturing to target) counts relatively higher than contributing to innovation (for example, research or projects). In this way, many organizations (including Novo Nordisk) have systems installed which drive exploitative behaviour. Another example or the consequence of my first example is the institutionalized PSPS, which is the current performance management system where activities can be seen to be driven by short-term performance indicators. The literature must provide a better guidance on how the balancing works to ensure sufficient balance between exploitation and exploration. Another answer could be the speed of changes, making institutionalizing of knowledge impossible, since the knowledge-management process works to slowly.

Guidance might be found in Crossan et al’s (1999) learning models where the introduction of the feedback model as exploitative and the feedforward model as explorative is introduced. I could consider a third model based on Ogata’s (1970) mathematical models for feedback and feedforward loops from the world of control engineering. The purpose of both systems is to eliminate undesirable effects of disturbances. The difference is that the feedforward system introduces compensation before the disturbance materializes, and that in the feedback system the compensation happens as result of the unwanted outcome. The most precise system will be the combination of compensation and correction, which means a balancing of exploration and exploitation. In figure 6 the control system can be seen constructed based on the perspective of organizational learning.

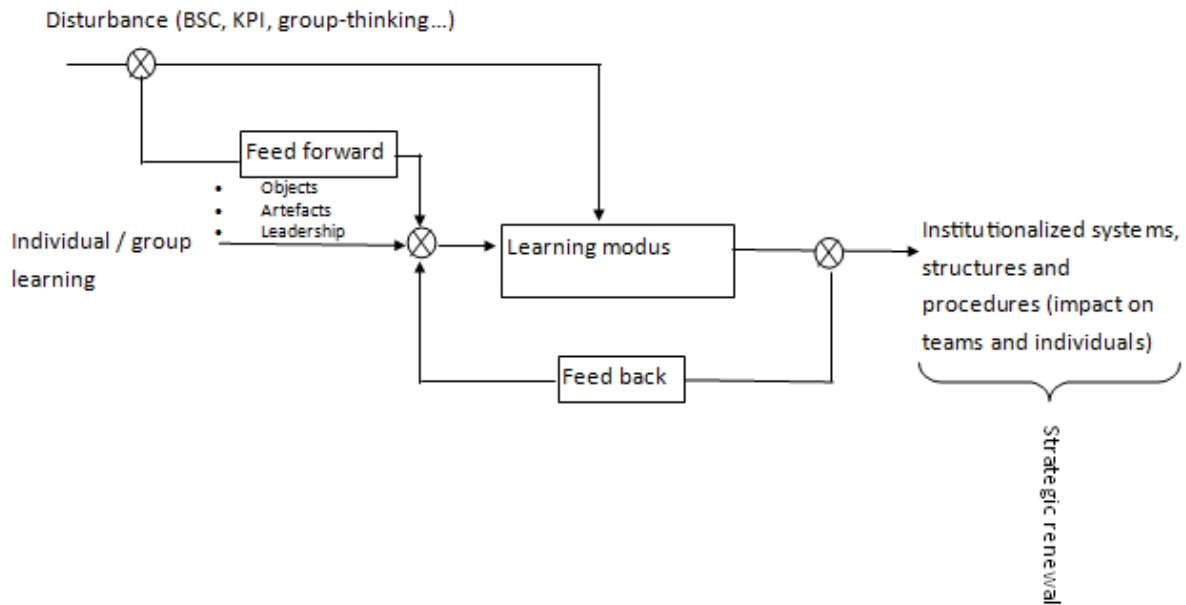


Figure 6 Balanced learning model.

The figure shows that the balancing of the outcome (learning and strategic renewal) requires a balancing of the input based on feedback and knowledge about the possible disturbances. The model based on the literature provides insight to what can be barriers for organizational learning and how input can be adjusted to compensate for the disturbances. For example, I can suggest that the introduction of the “virtual factory” will be a disturbance to the dominating compliance thinking. This suggests that I should work on defining feed-forward activities, which can compensate the perceived disturbances. The risk is that my “disturbances” will be corrected in the institutionalized feed-back system.

The development of the model has shown that learning happens when assimilating new knowledge and, in this case, the cross fertilization between natural science and social science being mixed during the literature review. The model assists in the understanding of the tension as a structural problem and one that can consciously be balanced when understanding the elements of organizational ambidexterity.

2.3.3 Can organizations learn?

In general, most authors agree that in a sense organization’s do not learn, the humans in them do (Senge, 1990). The problem in this perspective is that the organizational knowledge is won or lost with the individual members. The individual learning is a necessity for organizational learning (Senge, 1990), but at the same time it is not guaranteed that organizations learn when individuals do. The individuals must act in a social context, which Easterby-Smith (1997) suggest results in wider learning. This is seen

as the core in organizational learning. The basic assumption is that innovative ideas happens to individuals (Nonaka and Takeuchi, 1995; Simon, 1991), but only comes to bear from the social interaction in sharing actions where common meanings are developed (Argyris and Schon, 1978, 1996; Daft and Weick, 1984; Huber, 1991; Stata, 1989). Macpherson and Jones (2008) and Shrivastava (1983) argue that the movement from individual intuition and learning to organizational learning as institutionalized behaviours can be facilitated through objects and artefacts. The artefacts as common ground for learning (Macpherson and Jones, 2008) can be exemplified within my own practice in the creation of the virtual factory, and the adherence to PSPS book of better practices.

Further examples can be found in Kerka's (1995) suggestion that learning organizations are promoting a culture of learning as a community of learners. The individual learning enhances the organization as a whole when learning is shared and used by the organization (Senge, 1990). The literature provides the argument that there exists no organizational learning without individual learning. This perspective resonates with Thorpe and Holt's (2008) assumption that knowledge cannot be separated from the knower. This dominant thinking within the literature is one of the main reasons for me to include the aspect of organizational learning as a cornerstone in the establishment of the virtual factory. The organization must comprehend something new, for which there was no prior explanation. I see my thinking resonating with the literature in the argument that individual intuition develops through a common understanding in the team, and finally is organizational learning when institutionalized (Crossan et al, 1999; Senge, 1990). What is then organizational learning? Can it be seen as the social interaction where new knowledge is created by common interaction? Is it simply the assimilation of existing knowledge? Or is it everything? I do not find that the literature provides a clear answer. However, it is widely shared that the social element is an enabler for organizational learning and becomes an evolution through the interaction between "knowers" (Thorpe and Holt, 2008).

Thorpe and Holt (2008) suggest, based on that organizational learning is driven from social interaction, that knowledge cannot be stored. Hence, it can be argued that organizational learning is a snapshot of the current organizational manning, interacting in a social context. The argument seems in this way to go against the idea of institutionalizing the individual knowledge as object, artefacts, and becoming the way of doing business (Macpherson and Jones, 2008). However, I see some recognizable elements in Thorpe and Holt's (2008) thinking which might be decisive for organizational learning or not. Working from the assumption that no two situations are the same the patterns might be similar, but never the same. I could suggest two types of organizations, where either corresponds to the two different perspectives.

Thorpe and Holt's (2008) thinking could represent the exploitative organization based on specialists who are strongly cognitive in focusing on

pattern recognition and are past pattern oriented. The other organizational structure is the explorative organization where the entrepreneurial spirit drives innovation and change, looking for new connections and possibilities. This latter future-oriented organization creates the entrepreneurial space (Macpherson et al, 2004) which allows for the assimilation of external sources of knowledge but could be less good in sustaining existing knowledge. Thorpe and Holt (2008) argue that the knowledge is tight to the individuals but shall co-exist with the more general perspective on social interaction. This is to allow for utilization of the full body of knowledge as well as creating the renewal needed to face future challenges. The perspective is exemplified in Lane's (2001) assumption that organizations can become storehouses of experience, making the whole body of knowledge less vulnerable and less dependent on the presence of individuals. However, within a philosophical stance where the context and social interaction are cornerstones this perspective can be disputed. The co-existence with social interaction (Thorpe and Holt, 2008) speaks against the "storehouse" thinking. Lane (2001) suggests that the lifespan of organizations will depend on the ability to assimilate and diffuse new and old information, which could indicate that the age of an organization can influence the learning capability. This argument can also be seen to go against the "storehouse" thinking, as organizations will cease to exist when learning stops. It can be argued, that by applying these lenses, organizations can create a "memory" of tacit and explicit knowledge. This can be referenced as learning, or maybe a better term to use would be "intelligence". The "storehouse" as suggested by Lane (2001) can be seen similar to the brain metaphor that I previously have applied and might also resonate with Lane's (2001) thinking in terms of the organizational lifespan.

2.3.4 Shifting tacit into explicit knowledge.

Nonaka (1991) and Nonaka and Takeuchi's (1995) argue that the ability to shift tacit into explicit knowledge is the heart of knowledge creation. The authors see the articulation of tacit knowledge as a dynamic interrelationship where the embedded knowledge in the organization is made explicit. The shift from tacit to explicit knowledge is different from the assimilation where new input from new members might be suppressed by the culture or where new knowledge from outside is acquired (Crossan et al, 2011). The learning model can be argued to become effective in older organizations where the "not invented here" culture blocks assimilation of knowledge from outside. However, it can be argued that part of Nonaka and Takeuchi (1995) work clearly inclines towards assimilation, especially in the socialization perspective where it is claimed that learning comes from observation, imitation, and practice. This is a way to transfer the prevalent "ways" to the newcomer or novice. The principle is also found well described in Taylor's (1998) studies of Scientific Management during the start of the past century, and later refined and adapted by successful companies as Toyota in their Toyota Production System (Liker, 2004). "Explicit" does not necessarily mean written in procedures, but also means expressed or

demonstrated, or in terms of artefacts and objects as discussed in section 2.3.3 (Macpherson and Jones, 2008). Neve (2003) argues that shifting tacit into explicit knowledge is not learning since the knowledge is already present within the organization. However, it can be agreed that knowledge has been spread to more individuals within the organization and rather acts as knowledge management than creation of new knowledge. Furthermore, the impact on organizational performance cannot be neglected, which can be seen from Novo Nordisk's successful introduction of the PSPS booklet. The journey supported by the PSPS thinking has created performance improvements in relation to capacity utilization and quality compliance, and consequently reducing the cost per unit produced. Albeit the reduction in cost of the operation can be seen as outcome of the changes, my focus in the research is to understand and create organizational learning as the means.

The clarity on learning versus knowledge management does not become clearer from the discussion above. Lam (2000) suggests that there exists a problem within the literature. The author argues that knowledge is socially embedded, but rooted in routines, and the social interaction acting as a transmitter, and a way to communicate knowledge which is personal and contextual. The argument resonates with Thorpe and Holt's (2008) suggestion that knowledge cannot be separated from the knower, an argument building on Polanyi's (1962, 1966) (referenced in Lam, 2000) suggestion that the origin of all human knowledge is the individual intuition. Hence, the organizational learning capacity dependent on the mobilization of tacit knowledge and the transformation to ensure that same knowledge is available in all parts of the organization. However, making something explicit does not automatically mean that understanding is shared. I see this as a weakness if the model is taken in isolation and not including the social interaction ensuring the common understanding. The problem can be exemplified in the operation according to special operating procedures (SOP), which is seen within many manufacturing organizations. Individual learning is expected from reading the procedure and with a uniform behaviour as outcome. However, the social interaction is often not present, and the learning will become individual and cognitive, hence not resulting in organizational intelligence.

2.3.5 Organizations as brains and use of metaphors.

I have decided to include the following section as an emerging discourse even that the metaphor can be dated back to the late 1940s (Morgan, 2006). The discourse is important since it creates a metaphor of the organization as a brain, an element of our body which might be the least understood. Thus, it can be argued that investigating organizational learning can turn out to be anything but a logical task. Could organizational learning be an emergent process that we try to explain from a cognitive perspective and in this way becomes unclear in the definitions? I have earlier in the chapter argued for looking at organizational learning in a broader perspective and have used the term "intelligence" as substitute for organizational learning since it has been

unclear what was learning and what was sharing of knowledge. I found the inspiration in the movie “Limitless” and from reading Morgan’s (2006) metaphors to see the organization as a human brain and the elements included in organizational learning as organizational intelligence. The metaphor became a catalyst and started to make good sense since I could avoid thinking about if knowledge was generated, assimilated, or shared; it was still “intelligence” and it would improve the performance of the organization.

However, the main topic within the discourse is if it is possible to design organizations as the functioning of a living brain. The advantage is that we can talk about organizational intelligence as the result of learning, acquisition of knowledge and information, and of sustainability as where the whole is encoded in most parts. In the brain metaphor, and from a sustainability perspective, it becomes sense-making to ensure a transfer of the whole to all individuals as suggested by Nonaka and Takeuchi (1995) in section 2.3.4. This makes the organizational brain less vulnerable to damages caused by individuals leaving. However, Morgan’s (2006) metaphor also allows room for specialized functions as some parts of the brains are more specialized than others, and in that way can be argued to represent the organizational functioning. In the discourse on the brain metaphor we also see the discussion on the tension between exploitative and explorative learning in the context of the left and the right hemispheres, and the importance of the collaboration between the two sides. The metaphor can also be used when arguing for the necessity of co-existence of the different learning models, and that the ultimate purpose of organizational learning is strategic renewal (Crossan et al, 1999). However, the similarities and the focus on the understanding of the brain and organizations still need to find its way into the literature. Morgan (2006) sees that the use of the brain metaphor is in its early days. However, a dozen years later I still do not see the brain metaphor used in the literature despite a general acceptance of metaphors as supportive in the process of organizational learning (Crossan et al, 1999; Said et al, 2001; Macpherson and Jones, 2008; Sadler-Smith, 2016; Yob, 2003). However, it is important to understand the use of metaphors and how to analyse them in a systematic way.

The literature (Crossan et al, 1999) describes the use of metaphors as an aid to the individuals in the phase of interpretation of intuition and in the communication to others. It is suggested that metaphors become the link from individual insights to a shared group interpretation especially when no literal language exist (Crossan et al, 1999; Sadler-Smith, 2016). Antle et al (2009) further suggests metaphors creates an even deeper understanding than linguistic conversations, which was seen in the studies related to the humans understanding of computer interfaces where it could be seen that where metaphors involve an interaction with concepts the systems were perceived easier to use. This perspective could say something about the appeal of the metaphors and how we understand the description of something where we do not have a language. The metaphor creates a bridge between the source and the target to express similarities (Sadler-Smith,

2016) and at the same time we apply filters to the understanding of that source and target is not exactly the same (Yob, 2003). The metaphor can be suggested to be a path in meaning formation (Raidl and Lubart, 2001). However, in this understanding and use of metaphors it was observed by Sadler-Smith (2016) that metaphors were used to describe the outcome (intuition) of intuiting and not the process itself. This resonates with Shrivastava (1983), Macpherson and Jones (2008) who suggests the metaphors as the common ground for the transition between individual level to the organizational level of organizational learning.

However, the transfer of information from a familiar domain to a new and unknown domain contains a risk related to the incompleteness embedded in the common understanding created (Morgan, 2006; Said et al, 2001). Metaphors cannot be self-explaining and can only be understood in the social context of dialogue (Said et al, 2001). This leads me to suggest that the objectivity in the analysis of metaphors is part of the context and cannot be separated also due to the applied filtering of meanings (Yob, 2003). Communicating an understanding created in a certain context creates a risk of misunderstanding (Morgan, 2006; Said et al, 2001), which leads me to suggest that use of metaphors within research requires a methodology where the researcher is an insider to understand and analyse the meanings and applied filters. Sadler-Smith (2016) suggests that metaphors is a means of understanding organizational life, which resonates with my introduction of the brain as representing the organization and my understanding of co-existence of exploitation and exploration in the same way as the collaboration of the brains right- and left hemispheres.

The recent focus on Industry 4.0 and artificial intelligence can lead me to consider if this trend could foster more focus on the brain as metaphor for the “analogue” organizational dynamics. I saw the metaphor as a catalyst in the definition of my research and in how we can improve the utilization of knowledge.

2.3.6 Summary

It became clear from the different aspects of the literature that the term “survival” does not necessarily refer to a crisis situation. Macpherson et al (2004) took the survival motivation for cognitive learning into the perspective of dynamic capabilities, which can be argued to focus the motivation on the long-term sustainability. The systematic modifications to the organizational capabilities in the pursuit of improved effectiveness (Macpherson et al, 2004) can still be argued to be an adaptive behaviour, but not necessarily a reaction to a crisis. Survival might be the motivator, but the discourse on balancing exploitation and exploration, can be argued as the means to obtain the preservation of the organization in the longer perspective.

The internal allocation of resources to exploitative and explorative activities is a discourse that can be found addressed in most of the reviewed

literature. Senge (1990) summarizes the reason for the tension as our inability to link activities to consequences and especially in the exploratory view where long time delays might exist between cause and effect. The phenomenon has gained a position as a construct under the headline of organizational ambidexterity, which has been well investigated by Birkinshaw and Gibson (2004), Birkinshaw and Gupta (2013), and March (1991). The discourse is important in the light of that the literature on organizational learning has a tendency to create an idealistic picture on the importance of learning (Senge's "The fifth discipline") without realizing a need for day-to-day results. It can be argued that the balancing of exploitation and exploration is a tension most likely connected to structures and is a dynamic that we need to become better in understanding.

In the literature, Strategic renewal is presented as the objective of organizational learning (Macpherson and Jones, 2008) and as a way to face future challenges. The perspective becomes relevant in the discourse on 'if organizations can learn' and also towards the evolutionary perspective, which in general seems dominant in the literature. It seems commonly accepted, from the literature review that organizations learn through the individual member and the institutionalization of knowledge, which happens in the social context of an organization. To ensure organizational learning, the organization will be dependent on the intuition and generation of tacit knowledge at the individual level, but also that the structures allows for a sharing and creation of common experiences at the team level. Macpherson and Jones (2008) suggests that the shifting of tacit to explicit knowledge does not necessarily come as written procedures but can be facilitated by artefacts or simply by the master and apprentice learning model.

The different established discourses that have been reviewed were focusing on what could be understood as an evolutionary development of learning. I can argue that the academic literature is following the same evolutionary development, even though Crossan et al (2011) calls for a more structured approach towards a strengthening of the theory prior to the expansion in number of constructs. However, it seems like the evolution in the constructs continue, but it is difficult to understand if the evolution is driven by requirements from the industry or a fight for limited resources. The development of the different constructs can be seen to be rooted in learning models which in Leavitt's (2011) work on organizational learning has been structured into "schools". This principle seems as a way forward to create more clarity on if the constructs can be seen as evolution, or if Crossan et al's (2011) criticism holds and that the increasing literature is creating more confusion.

2.4 Three schools of organizational learning

I gained insight to a "jungle" (Visser, 2007) of constructs and definitions throughout the preliminary phases of the literature review. These were contributing to the complexity in understanding organizational learning.

However, the literature also provides attempts to create order to the system. An interesting and useful model is found in Leavitt's (2011) separation of organizational learning into two distinctive schools: the cognitive, focusing on the thinking; and the behavioral, focusing on the doing dimension.

Leavitt (2011) presents the two schools as distinctly different since: 1) the cognitive learning is argued to happen through mental models and structures, which enables an understanding of situations and enables us to respond to changes; and 2) the behavioral perspective suggests that the learning takes place by gaining insight from experiences through experiments. The latter action-oriented learning process resonates with the early thinking on learning models based on passive response to external stimuli. I can in this way argue that the model becomes a behavior regulating mechanism and, in this way, is distinctly different from cognitive learning.

I will also suggest a third school based on Senge's (1990) focus on creation of new knowledge from explorative thinking. The learning is driven from an organizational desire to obtain better performance through interaction between individuals. I will also suggest that this third school provides a bridge between the different learning processes.

2.4.1 The cognitive school.

Thorpe and Holt (2008) suggest that knowledge cannot be separated from the knower. This resonates with the perspectives of the cognitive school where it is the individuals who are learning. This is also the perspective underpinning Argyris' (1976; 1977) original works on learning loops, which by Anderson et al (2015) is perceived as seminal contribution to organizational learning. The individuals store and organize impressions from the context or experiment and we learn by recognizing connections and patterns whether it is in a single-loop (the thermostat) or double-loop (systems understanding) context. The learning can in this way be argued to become detection and correction of errors (Anderson et al, 2015) as I indicated in my balanced learning model (fig. 6).

In Argyris' model the assumption is that decisions are made on incomplete information and that feed-back is needed to evaluate the effectiveness of the applied actions. Repeated frequently enough this process will allow individuals to recognize the situation and learn from previous outcomes. The conscious reflection on outcome can be said as being a main difference between the behavioural and cognitive school and has resulted in the learning-curve introduced in the industry by Wright in the late 1930s.

It can be argued that the double-loop learning involves more awareness of paired events and in this way higher cognitive involvement than the linking of stimuli and response as seen in single-loop learning (Bandura, 1971). Argyris' works on learning models done in the middle and late 1970s are well

founded within the cognitive learning theory, which shows a “corrective” behaviour when certain patterns are recognized. This is in the social theory (Bandura, 1971) referred to as cognitive control of conditioning phenomena. It can be difficult to imagine that an organization can recognize and react on stimulation, whereas understanding behaviour from the individuals seems common sense. From this perspective, and following Macpherson et al (2004), the isolation of the cognitive learning will risk not increasing organizational “intelligence”, but creating the organization of experts, which was discussed in section 2.3.4. The argument resonates with Argyris’ (1976) observations that individuals are mostly single-loop learners when dealing with other humans (in a one school perspective), which also support Doyle’s (1997) argument that no evidence exist that learning organizations are more effective than more static structures.

The conscious evaluation of stimuli is seen to be applied in some of the constructs, for example strategic renewal, where the pattern recognition is used in the motivation for learning. As the impact of external pressure is amplified by managers the recognition of the stimuli creates an artificial “burning platform”, which is used to justify behavioural regulation and to encourage emergent learning for survival. Volberda et al (2001) argues, in the cognitive context, for strategic renewal as an altering of the path dependency and operating in an explorative domain with focus on generation of new learning to meet future challenges. The construct holds a link to the cognitive school (the entrepreneurial part) since the imagination of consequences related to the change or decision on path will be based on recognition of past experiences. I can argue that strategic renewal is a “tool” within the cognitive part of organizational learning. Crossan and Berdrow (2003) apply this perspective in their investigation Canada Post Corporation where an element to improve strategic renewal is the infusion of managers from outside. However, the infusion talks against what, according to Crossan and Berdrow (2003), is the dominant organizational behaviour, where knowledge is assumed protected by retaining the knowers. The model makes the “appliance” of strategic renewal very difficult if based on assimilation of knowledge from outside. The perspective on strategic renewal as a tool can be seen as contradictory to what has previously been argued by Crossan et al (1999), that strategic renewal is the principal means of learning and as such it cannot be seen as a learning model, but rather as an outcome.

The learning model also holds a tension in the balancing of daily survival through exploitation and the more idealized focus on the future through sustainability. Macpherson et al’s (2004) have in their work on dynamic capabilities acknowledged the dilemma and complexity in building new capabilities while ensuring continued business. The dilemma seen from Volberda et al (2001) and Macpherson et al (2004) can be perceived as a situation where the balance between the brains hemispheres is required and where cognitive or behaviour perspectives becomes insufficient. The observations resonate with Crossan and Berdrow (2003) who further suggests that a prevailing tendency is then to focus on exploitation. This can be argued from that the exploitation is well articulated in the literature, and

from the logical hemisphere through interpreting, integrating, and institutionalizing.

2.4.2 Behavioural school.

The early research on learning mechanisms is covering the behavioural elements (Leavitt, 2011) and suggested based on assimilation and operating procedures. The assumption is that all behaviour can be explained without considering internal mental state or consciousness. The compliance organization could be the example of an organization based on behavioural learning, institutionalized systems (Simon, 1994) and standard operating procedures (section 2.3.4) to ensure a predictable outcome. This kind of organization seems to be attractive to many manufacturers and to my experience also the dominant learning model within Novo Nordisk. However, Crossan et al (1999) suggest the predictability is coming with a downside since organizational learning becomes infrequent when institutionalized. The perspective resonates with Simon's (1994) suggestion that institutionalizing and diagnostic systems can become limiting barriers for learning since focus on knowledge is driven by what is found important among influential members of the organization. The learning process also becomes slower due to group considerations and consensus on what is better practices. The process can be perceived as bureaucratic, which will discourage learning. This leads me to suggest that at Novo Nordisk the bureaucracy related to potential changes of processes prevents many individuals from bringing new information forward. However, the learning model can be argued to ensure survival through the predictability and compliance but limiting the creative hemisphere of the brain

A criticism towards the behavioural school can be argued to be the simplicity that we see included in assimilation and standard operating procedures. Doyle's (1997) claim that the model is a simplification of a complex psychological theme. Leavitt's (2011) behavioral school seems to focus on creating a "memory" where knowledge is captured and becomes institutionalized. Nevis et al (1995) refers to this phenomenon as organizational learning by assimilation, a behavior Doyle (1997) argues to happen in any meaningful organizational structure. The argument can be explained in that the behaviorism is looking at learning as response to stimuli or experiences. Thus, the argument can be linked to cognitive learning, which in contrast might be seen based on an inner stimulus and not the same passive response to stimuli as is the assumption within behaviorism. However, in the brain metaphor, the behavioral school can be contributing to sustainability of organizational intelligence when holography thinking is applied (Morgan, 2006), creating an encoded version of the whole in all parts.

The thinking behind the behavioral school can in its focus on institutionalized knowledge be argued to be in contradiction to Thorpe and Holt (2008) thinking that learning cannot be stored but is an evolution. In

the institutionalizing perspective the behavioral school can become a barrier for new perspectives and knowledge or be argued to be a model where knowledge risks being expired (Crossan et al, 1999).

2.4.3 The Social school

Senge (1990) could be seen providing the “missing link” to the social context in his “in between” definition, suggesting that organizational learning and generation of new knowledge happens when new and explorative thinking is supported, when individuals expand the capacity to create desired results, and where individuals learn how to learn together. The learning context based on social interaction and an experimenting culture (Cook and Yanow, 1993) is the elements, which could be argued to complement Leavitt’s cognitive and behavioral schools. The link is described in the social learning theory developed during the 1970s by Bandura (1971) and referred to as the bridge between behaviorism and the cognitive learning theory.

The social school is characterized by the interaction between the individuals within the organization and can be seen anchored in Bandura’s (1971) social learning theory, which suggests that people learn from each other via observations and imitations. I find that Bandura’s (1971) theory resonates with Stacey’s (2011) argument that the social school should be the place of organizational learning coming from the replication and transformation of knowledge, which may take place in the cognitive hemisphere. This leads me to consider that learning can be a cognitive process in a social context. Gherardi (2001) suggests a network socially woven around a domain of knowledge with focus on enactment. The learner is not a passive recipient but is actively acquiring information from other individuals across the boundaries of the organization and knowledge disciplines. Dusya et al (2015) suggests that these boundaries are fluid and evolves along the dialogue between the individuals. Easterby-Smith et al (2012) suggest this learning is happening as knowledge is passed tacitly between individuals as part of work-related events.

The problem is that it can be questioned if organizations learn from this interaction. One could expect that business failures should become less from increasing organizational knowledge (Bapuji and Crossan, 2004). However, Stacey (2011) suggests that business is failing as frequently today as during the past two centuries. Could this perspective mean that organizations do not learn? Do organizations have a built-in inability to learn despite the social interaction? Or is the business environment getting so much more complex that the unknowns remain constant despite increasing learning?

Bapuji and Crossan (2004) have identified three barriers for organizational learning, which can be placed within the social hemisphere: 1) employing known solutions, 2) employ only proven solutions, or 3) solutions close to known solutions. All three barriers can be argued to be found within the exploitative learning models, which are arguments that I also hear in my

practice within Novo Nordisk. Bapuji and Crossan (2004) further suggest that mature organizations with internal experience are more prone not to learn and are relying more on internal knowledge. I have found empirical evidence supporting Bapuji and Crossan's (2004) findings within Novo Nordisk's global supply network where a comparison of seven similar manufacturing units with same knowledge and business complexity shows completely different performance levels and capability to utilize better practices (see fig. 7). The curve shows a correlation between the years of existence and the current performance.

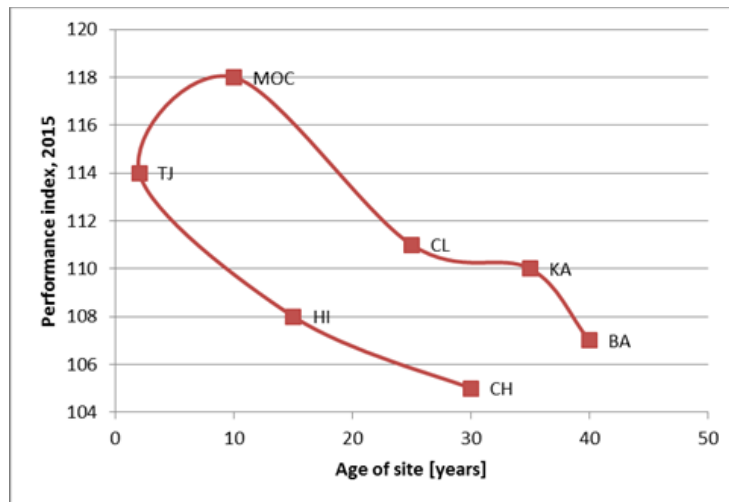


Figure 7 2015 performance data from seven similar units.

Newer organizations show in general a better performance which could be attributed to better learning capabilities.

A hypothesis could be that the social hemisphere is dysfunctional at the older units and the attitude to learning becomes a reaction where institutionalized and diagnostic systems have taken over (Simons, 1994) and organizational learning becomes internal assimilation towards what is perceived as better practices. The hypothesis resonates with Macpherson et al's (2004) reference to a need for an entrepreneurial space to exploit external knowledge resources, and also explains that the cognitive contribution might be a blocking element in a fast-changing environment where the patterns we know expires fast. I can, based on the discussion, suggest that the social interaction cannot be a guaranty for learning since the cohesiveness in local organizations might create barriers to assimilate new knowledge.

At Novo Nordisk the CEO is encouraging experimentation while advocating for a "forgiving culture". However, as seen in the previous example this encouragement dies out in the social interaction and institutionalized knowledge. It can be argued that the social interaction is not enough to create new knowledge. The entrepreneurial room as suggested by Macpherson et al (2004) seems to be the enabler, which drives the social

interaction beyond the mere institutionalizing of existing knowledge. By referencing the methodology of action research and the focus on work-based learning it can be recognized that the social context can be seen as learning in the midst of practice (Anderson et al, 2015). In the social context the participating individuals reflect on their own mental model and apply the meta-competences, which involve the social interaction. It can be argued that the social context must include the entrepreneurial thinking as suggested by Macpherson et al (2004) to result in creation of new knowledge. The social context must in this way include a motivational element for the individuals to undertake development of their own organization.

2.4.4 The model of the three schools

In the previous sections, the social context was found to be an important lever for organizational learning to happen and an element that I find missing in Leavitt's (2011) models. However, the insight gained through the literature review allows me to combine the different lenses in a three-school model (fig. 8).

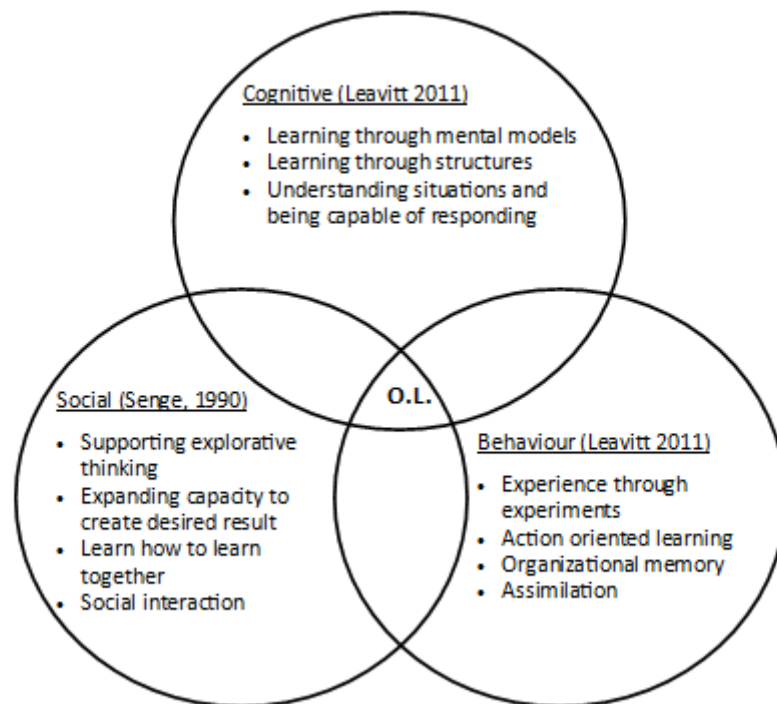


Figure 8 The three learning schools

The separate learning models can be seen as linked or as prerequisites for each other in the creation of organizational learning. It can also be argued that the social school represent the “entrepreneurial room” (Macpherson et al, 2004) where individual insight is not only shared, but challenged and further developed into new knowledge. This perspective will allow looking at

organizational learning as the complementary of the three schools, as indicated on figure 8. The argument for this construction is found in Macpherson et al's (2004) suggestion that the isolation of knowledge resources will work against improved performance.

2.5 Dominant learning constructs.

The literature provides several suggestions on the dynamics and development within the process of organizational learning. Through the literature review I experienced that many of the learning models were developed from late last century and to a large extent building on same principles. To understand the mechanisms by which organizations learn I have created an overview of the models that I have found the most dominant.

My review focuses on the learning models, related to organizational learning. However, I acknowledge Romme and Dillen's (1997) observation that, since organization learn through the individuals, nearly all theorizing about organizational learning is based on individual learning.

The section is divided into a subsection describing the development of additions to the 4I framework and a subsection explaining the mechanisms of organizational learning as per the same model.

2.5.1 Development of models over time.

During the literature review I found the first signs of an explicit model in Cangelosi and Dill's (1965) article on organizational learning related to management decision-making. The simplified model includes four phases: initial phase, searching phase, comprehending phase and consolidating phase. The uninterrupted progression is a process that can be extended to cover all suggested models. Further concepts were found in Daft and Weick's (1984) model containing the phases: Scanning (data collection), interpretation (understanding the data) and learning (taking action). In Daft and Weick's (1984) model it can be suggested that the organization becomes the interpretation mechanism, which later becomes more explicit in Crossan et al's (1999) 4I framework.

In 1993 Kim created a learning model with focus on linking between individual learning and organizational learning. Kim (1993) suggests that all organizations learn (consciously or not), which required a deeper understanding of the transfer mechanisms between individual and organizational learning. The starting point is the learning models related to individual learning. However, the argument is that organizational learning requires imparting individual learning capabilities to a non-human entity, which seems to be a general controversy within organizational learning, albeit also a generally accepted assumption. Kim (1993) acknowledges the common elements between individual learning and early phases of organizational learning and especially with a focus on the size of the

organization. The model operates at three level (individuals, smaller organizations, and larger organizations) and four phases: Observe, assess, design and implement. The implementation is referring to the shared mental models created through the earlier phases. Kim's (1993) framework addresses the context of learning in the consciousness of the phases and inter-level conversion.

Towards the end of the past century two of today's dominant constructs appeared. The 4I, Intuiting, Interpreting, Integrating, Institutionalizing (Crossan et al, 1999) and the SECI, Socializing, Externalizing, Combining, Internalizing (Nonaka et al, 2000). It can be suggested that the constructs contain similar elements. For example, the dynamic spiralling between the different levels (individual and groups) is a key element within both 4I and SECI. This dynamic draws on the necessity of the social context, which will be inevitable when discussing learning in an organizational context where shared understanding is a cornerstone. However, the two models are also distinctively different from each other. The SECI model (Nonaka et al, 2000) is suggested to assume that knowledge is created through conversion between tacit and explicit knowledge. Lewis (2014) found this assumption to be insufficient in a holistic knowing perspective. I see the dynamic as a constant exchange between the individuals' intuitive processes and the shared thoughts and common experiences of the group. Therefore, I suggest the SECI thinking is embedded in the 4I learning processes, where the same oscillations between individual and group levels are described and where the changes between tacit and explicit knowledge can be understood as part of the "intuiting, interpreting and integrating" processes.

In Crossan et al's (1999) 4I model a conversion is seen between multiple layers (individual, group and organization) and on the different phases of knowledge creation: intuiting, interpreting, integrating and institutionalizing. The difference between the levels and phases can be somewhat overlapping. However, the difference between "individual"/ "group" and "organization" is in Crossan et al's (1999) model clearly indicated from "institutionalizing". This phase contains explicit new ways of operating based on standards, procedures and objects (Crossan et al, 1999; Sisson and Ryan, 2016). Institutionalizing can become a competitive advantage by converting learning into new practices (Aponte and Zapata, 2013) and as suggested by Pyrko and Dörfler (2013) develop into strategic renewal when shared on a trans-organizational level. Further learning from outside the organization can be seen as an addition to Crossan et al's (1999) 4I model. Similar suggestion could be seen in Jones and Macpherson's (2006) research on organizational learning within SME's where observations show interaction (intertwining) outside the investigated organization. The observations can suggest that learning progresses go beyond the institutionalizing phase and beyond the border of the organization and in this way be seen as add-on to Crossan et al's (1999) original model. It can be suggested that institutionalizing becomes a phase from where new learning converts into new ways of operating and in this way, it is effectively the outcome of learning.

More contemporary research (Zietsma et al's, 2002) on organizational learning within the Canadian logging industry, has created new insights to the understanding of what I see as the early innovative phases of learning (Intuiting). The research suggests that the intuiting phase included an element of information seeking, which is not included in Crossan et al's (1999) original definition. From Crossan et al's (1999) model it can be suggested that intuiting is restricted to be a subconscious process. This assumption may be a simplification of a phase that is related to triggering curiosity within the individual. However, Zietsma et al's (2002) perspective creates the opportunity of co-existence of both conscious (information seeking) and sub-conscious processing as part of intuiting. Furthermore, Zietsma et al (2002) found that the interpreting phase contained experiments, which were suggested to create additional data for interpreting.

From the reviewed literature (Zietsma et al, 2002; Dane and Pratt, 2009; Sadler-Smith, 2016; Hodkinson et al, 2008; Dörfler and Ackermann, 2012; Akinci and Sadler-Smith, 2012) there seems to be a large population of conceptual thinking about intuition and the process of intuiting. Akinci and Sadler-Smith (2012), in their historical review, created an overview of intuition from different authors. Examples are: "Rapid response through recognition" (p.107) and "An expert's rapid recognition and response to familiar cues, giving access to explicit and tacit knowledge acquired from learning and experiences stored in long-term memory" (p.107). However, Akinci and Sadler-Smith's (2012) historical review does not offer a view on the inclusion of intuition as part of the early phases of organizational learning as represented in Crossan et al's (1999) 4I model. Jenkin (2013) suggests an extension to the individual level of the learning model where individuals go through an interpreting phase. The initial intuition is challenged and reinforced by searching for information. Jenkin (2013) suggests this "information foraging" as a conscious activity related to the 4I's (Crossan et al, 1999) individual level and as a separate phase related to intuiting. Adding a sixth "I" to the learning model can be questioned since I might tend to relate the "information foraging" to somewhere between intuiting and the interpreting phase (figure 9). However, Crossan et al's (1999) original model also allows for interpreting within the individual level from increased insights (information seeking or dialogue on the topic). The importance of Jenkin's (2013) suggestion which resonates with comments from Pyrko and Dörfler (2013) is the acknowledgement of that the early phases of the learning model might be containing both conscious and sub-conscious processing and forming multiple loops instead of being shown as a linear progression for ease of explanation.

The discussed additions to the early phases of the learning model can also be seen to resonate with recent insights from Akinci and Sadler-Smith's (2018) research on learning from use of intuition in decision-making within the UK police force. Akinci and Sadler-Smith (2018) suggests, as seen from Pyrko and Dörfler (2013) and Jenkin (2013), that the individual level of intuiting might include more involvement of experience, pattern recognition and reflection than what can be derived from Crossan et al's (1999) original

learning model. However, there may also be a difference in the “processing speed” within the different additions. Jenkin (2013) suggests a deliberate search of information using different data mining tools, whereas I understand Akinci and Sadler-Smith’s (2018) thinking divided into more variations. The faster processing based on “professional expertise” and the rational inquiring from searching for knowledge and applying more careful considerations. This latter part cannot be defined as intuition and suggests that also analytical processes find its way to the early phases of organizational learning, which is not seen in Crossan et al’s (1999) original version of the 4I model. The process seems to resonate with Jenkin’s (2013) suggestion, which Akinci and Sadler-Smith (2018) referenced as “deliberating”; however, in order to comply with Crossan et al’s (1999) alliteration the suggested additional process is labelled “inquiring”. The chosen label can in this way also be said to accommodate my concerns of mixing intuiting in decision-making and intuiting in organizational learning. I find that intuiting could be a misleading term of the mechanisms in the early phases of organizational learning if seen as isolated, as suggested in Crossan et al’s (1999) 4I model. My concerns resonate with Dane and Pratt (2009) questioning their own three types of intuition: “Problem solving”, “Creative intuition”, and “Moral intuition”. The authors suggest that the slower speed of processing and linking to insights within “creative intuition” could disqualify this phenomenon as intuition. On the other hand, I do not find any literature suggesting that intuition and intuiting should be withdrawn from organizational learning.

Akinci and Sadler-Smith (2018) has in their research on decision making also addressed the pre-institutionalizing phases (group / small organizational level), which can relate to how the learning is absorbed at group and organizational level. The absorption mechanism Akinci and Sadler-Smith (2018) suggests requires that we should add “internalizing” as a phase prior to the explicit institutionalizing phase. Akinci and Sadler-Smith (2018) suggest ‘internalizing’ is the mechanism between the group and organizational level where no formalized procedures are installed, however, learning exists based on the non-formal implicit and explicit knowledge experienced. In the terms of LMIOP this could be similar to the “steal with pride” culture embedded in the organization. We learn from other’s activities, but this is not formally integrated into structures or operating procedures.

In figure 9 below I have outlined the original 4I learning model and indicated (grey-shaded) the additions that I have discussed as part of the learning model review.

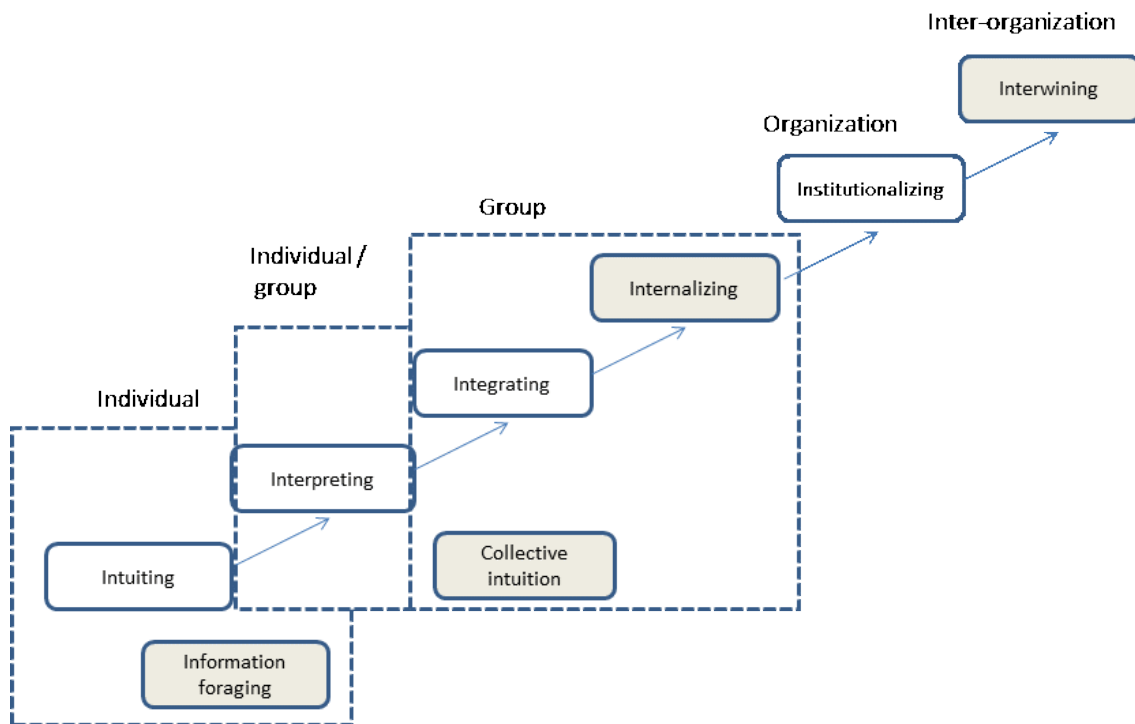


Figure 9 Additions to Crossan et al's (1999) 4I framework have been suggested by various scholars. Some examples are here indicated as grey-shaded.

Collective intuition is found placed parallel to the integration phases since this addition is despite the labelling a process based on group dialogue and where alignment has been obtained, which places the addition after the interpreting phase.

In the following discussion of mechanisms, I will focus on the four phases representing the original 4I model as suggested by Crossan et al (1999). I have for simplicity reasons not included indicators of the feed-forward and feedback processes. I recognize that the add-on's suggested to the model includes feedback processes like re-interpreting and re-internalizing. These processes are added to the feedback processes impacting group and individual learning, which are part of the original Crossan et al (1999) model. Akinci and Sadler-Smith's (2018) "re-interpreting" and "re-internalizing" represents a reconsidering of collectively constructed assumptions between the group level and the individual level and the learning that takes place at group level based on shared experiences. I suggest that a cycle of knowledge creation and learning takes place between and within the indicated phases. These dynamics are discussed in the following section.

2.5.2 Mechanisms of learning within the models

The discussed models all contain a conversion of knowledge or information between individuals, groups, organizations, and possibly also inter-organizationally. From the discussion of the models it is suggested that the conversion is not a unidirectional trajectory towards higher levels, which

also resonates with Berends and Lammers (2010) research on discontinuity in organizational learning. The mechanisms observed were related to how temporal structures affects the progress of learning and how learning might be abandoned, delayed or fragmented. Berends and Lammers (2010) research has helped me to understand some of the feed-forward and feedback dynamics that I find illustrated in Crossan et al's (1999) 4I model. I have, based on Crossan et al's (1999) 4I model, explained the mechanisms by which organizations learn. I have decided to maintain the structure given from the four phases within the 4I model since the literature review did not disclose a generally accepted revision of Crossan et al's (1999) original work.

The first phase "intuiting" is by Crossan et al (1999) described as a preconscious recognition of a pattern or possibility within the experience of an individual. From a learning perspective I suggest expanding this description to include the insights that eventually drive curiosity and exploration. The understanding of the intuiting phase relies on the understanding of the different definitions related to the learning mechanisms. The literature contains examples where intuition is "gut-feeling" and a judgment related to decision-making processes. However, Sadler-Smith (2016) argue this is descriptive of the outcome of the intuiting phase and an experience and evaluation that might guide the behaviours in solving a problem or following an opportunity. Sadler-Smith (2016) suggest that this implementing phase might be the part of intuiting that becomes "visible" to others. The processing is found described as rapid and spontaneous pattern recognition (Dane and Pratt, 2009). Sadler-Smith (2016) has further elaborated on the definition of the process of intuiting as: Automatic, rapid, subconscious processing; response to recognized patterns, supported by informational substrates from past experiences and prior learning (p.69). However, it does not seem that in organizational learning there is a specific need for 'rapid pattern recognition'. The definition I apply resonates with Hodgkinson et al (2008) who suggest a preconscious activity guiding individuals to novel and creative ideas.

Intuiting becomes a complex process, which can be difficult to articulate since it is inter-related cognitive, affective and somatic processes (Hodgkinson et al, 2008). The process and my own understanding become a phenomenon of non-sequential information processing (Sadler-Smith, 2016) arising rapidly and subconsciously based on prior learning and experiences, which guides the individual's behaviours. However, I suggest that the word "rapid" becomes contextual since the speed of processing might depend on a need for decision-making (here and now) and the time for organizational learning to be established. Intuiting cannot become rational analytical thinking. However, articulating intuition would move the processing into interpreting. I find that the literature (Sadler-Smith, 2016) can be seen to suggest some information processing described in the intuiting-intuition-implementing model. I find it difficult to draw a clear border-line between what is seen as purely intuitive and where information seeking influences behaviour. This uncertainty is indicated in figure 9 where I have placed

information foraging between intuiting and interpreting to make a link between them.

The complexity of understanding how individuals get to know something new seems critical to support innovation and learning within the organization. Even that Crossan et al (1999), describe the intuiting process as a subconscious way of developing insights it is also recognized that this process is more than a spontaneous “gut-feeling”, which resonates with Zietsma et al’s (2002) extension of intuiting to also include an active process of information seeking. Crossan et al (1999) frame intuiting in an exploitative (expert intuition) and explorative (entrepreneurial intuition) situation, which is pattern recognition and generation of new insights. This goes beyond the instinctively subconscious understanding. Crossan et al’s (1999) perspectives resonate with Akinci and Sadler-Smith’s (2018) research on intuiting where it is recognized that intuiting might mean different things based on the context. From the research in the UK police force it was seen that different functions had different time horizon on the decision-making process and therefore also different intuitive processes and different “implementing” (Sadler-Smith, 2016). The insights from Zietsma et al (2002), Akinci and Sadler-Smith (2018) and Crossan et al (1999) creates a picture of intuiting that goes beyond what Simon (1992) suggest as a speedy decision-making process based on recognition of patterns. However, these mechanisms are related to decision-making, which I find different from the learning context related to organizational learning. I can suggest that the kind of activities relating to the business environment within LMIOP mostly relates to what the authors’ reference as information seeking (foraging and attending) or “deliberating” (Akinci and Sadler-Smith (2018)).

The intuiting process can be seen both in the individual perspective, where individuals react emotionally and under pressure (Akinci and Sadler-Smith’s research on the police force), and in the business environment of LMIOP where the context allows for reflection, information seeking and dialogue, they are engaging in “information foraging”. The latter situation also creates an environment where “collective understanding” creates the same behaviour from individuals and the group. The phenomenon can be suggested described by Akinci and Sadler-Smith (2018) as collective intuition where the assumption is that the same intuition is obtained independently by the individuals within the organization. The phenomenon becomes of interest since the group of individuals who are part of my research typically have the same educational back-ground and a long tenure within Novo Nordisk with a strong focus on legacy processes and compliance. We have built our experiences through connection with different individuals but pivoting around the same processes, same company culture and same regulations. The collective intuition can be seen to expedite decision-making and support non-formal learning from experiences. However, in the learning context the phenomenon might also risk blocking new idea generation. The “non-formal” learning might include unchallenged perceptions, which might exclude other points of view. Berends and Lammers (2010) research can suggest that collective intuition can be understood as a dominant temporal structure and

potentially result in discontinuities in the organizational learning trajectory. This could especially become a risk within LMIOIP since the group who could be a source of collective intuition is also a group of respected and powerful senior managers.

The review of the different perspectives on intuition leads me to suggest the intuiting phase as: *a complex non-sequential information processing, which dependent on the situation can be seen as rapid and subconscious (Akinci and Sadler-Smith, 2018; Hodgkinson et al, 2008).*

The complexity can be seen in the co-existence of more mechanisms, which was seen from Akinci and Sadler-Smith's (2018) research on decision making within the UK police force and in the difference between the context of decision-making and the context of learning. In Crossan et al's (1999) perspectives the difference can be suggested to appear in the differentiation between "expert intuition" and "entrepreneurial intuition", which can be seen following different intuiting paths. One being the pattern recognition and closer related to the decision-making situation and the other being the innovative and change oriented situation. The difference in processing through intuiting-intuition-implementing (Sadler-Smith, 2016) helps in the understanding of outcome as: Decision-making, problem-solving, and creativity. I can suggest that my perspective is supported in the trend within the industry where individuals with an outside perspective are invited when innovative new ideas are needed. The trend is often attached to the idea generation phases using the concepts of "Sprint", "Short-and-Fat" and "scrum" (based on Takeuchi and Nonaka's 1986 "The new product development game"), which are becoming popular frameworks for managing knowledge work. It seems that we recognize some of the mechanisms and complexity related to intuiting and collective intuiting, how they enable learning in a non-formal manner and risk to prevent generation of new knowledge by blocking new ideas.

The second phase of Crossan et al's (1999) 4I process is the interpreting, which is a shift from the individual to the social context where the ideas are articulated and where learning shifts from being a subconscious individual process to become a conscious individual / group process in a social environment. It can be suggested that the mechanisms of interpreting are a calibration of the individuals' cognitive map towards a shared understanding. Even that Crossan et al (1999) suggests interpreting as a separate phase I find it difficult to separate the mechanisms from intuiting. The feed-forward and the feedback between the two different ways of processing can create confusion on what is intuition and what is analytical based on interpreting. I see dynamics where a continuous process of information seeking, and alignment is ongoing within the early phases of Crossan et al's 4I learning model. However, Crossan et al (1999) create a distinctive difference in the assumption of that interpreting happens in a social context whereas the intuiting is seen as an individual process. Feelings are turned into language and especially the experiences related to the articulation is lever to the cognitive map (Crossan et al, 1999) and

insights, which might be seen as the verbalization and conscious awareness of the problem (Hodgkinson et al, 2008). The conversion mechanism can be suggested to be supported in the appliance of objects and metaphors. Sadler-Smith (2016) and Raidl and Lubart (2001) suggest that metaphors can bridge between the source and the target in the process of expressing the individuals intuitive thinking and providing a path in the meaning formation that is embedded in the interpreting phase of Crossan et al's (1999) learning model. This resonates with Crossan et al's (1999) perspective that metaphors can help individuals in interpreting their intuitions and communicate them to others. The metaphors create a common language, which can make the use of objects and metaphors attractive tools to facilitate my planned change process within LMIOP. Crossan et al's (1999) perspectives can be seen further developed in Zietsma et al's (2002) "experimenting" as an extension to Crossan et al's (2002) original interpreting phase. The suggested mechanisms resonated with my earlier reflections on how learning develops in a constant feed-forward and feedback process where ideas and knowledge are further refined or rejected. The dynamics can also be seen in Berends and Lammers (2010) research on interruptions to organizational learning where the learning processes are suggested as cycles connected in a spiralling development of knowledge.

The mechanisms of interpreting take the initial ideas and thinking into the environment of the specific operation (Crossan et al, 1999), which also means that the knowledge expression will reflect that specific environment and that the knowledge cannot be expected to be generally valid and applicable. These reflections lead me to suggest that the second phase in Crossan et al's (1999) learning model is a mechanism where the organization starts to serve as a process of interpretation and improvement of the initial thinking and making the knowledge context specific. This will lead me to consider both the impact of my own presence in the function as leader of the organization as well as the stimulus I plan to apply during my research. To the first part Jansen et al (2008) suggest that I as leader and with focus on the aspiration can avoid fragmentation in understanding. This perspective resonates with Zietsma et al's (2002) focus on endorsement from individuals in a position of power. However, as seen in Crossan and Berdrows (2003) research on the Canadian post the risks are that my presence is peer pressure and that my intuition is forced through or at least create a feedback process impacting the interpreting among the individual participants.

The third phase in the 4I (Crossan et al, 1999) process is integrating. The mechanisms within integrating can be understood as the continuation of exchange between the individuals within a social context resulting in shared practices. The new knowledge becomes coherent and show collective actions (Crossan et al, 1999). The learning has moved to the group level, which Romme and Dillen (1997) suggest is where knowledge is exchanged and accepted by the individuals to be considered as continually evolving organizational learning. I find that Romme and Dillen (1997) could indicate that organizational learning has happened at an earlier state than what is

indicated in Crossan et al's (1999) definition, which focuses on installed procedures and structures as part of institutionalizing. However, I tend to understand Romme and Dillen's (1997) references to organizational learning as the evolving process in a social context.

Integrating is seen from coherent and collective behaviour and the use of a language reflecting the collective experiences and learning. Crossan et al (1999) suggests that the shared meanings created can cause mutual adjustments to actions and meanings for example through storytelling. These mechanisms draw lines back to metaphors as enablers during the intuiting and interpreting phase. The meanings created at the early phases are being mutually adjusted and the metaphors and objects can become the guiding elements for collective actions. A practical example can be seen in the LMIOP organizations use of a wall painting as object to enable the understanding of local manufacturing presence (fig. 10).



Figure 10 The wall-painting, which has become an object within the understanding of the LMIOP culture

The painting represents primarily the Danish management's shared understanding. However, the mechanisms of integration can be seen when the different Danish managers consistently apply the image as cover page on most presentations within and outside the full LMIOP organization. The experience obtained by the Danish managers is being transferred to the rest of the organization where same behaviour is seen. Crossan et al's (1999) perspectives and the LMIOP example can be suggested to resonate with Akinci and Sadler-Smith's (2018) reference to internalizing. The LMIOP wall-painting is an example of how internalizing becomes explicit as an object and driving a non-formal conversion of knowledge and culture.

The internalizing process does not exist in Crossan et al's (1999) process for organizational learning; however, I find the insights important due to that the composition of my management team can be suggested to draw lines to Akinci and Sadler-Smith's (2018) observations on behaviours within the UK police force. Furthermore, I find the insight important to avoid misleading

myself to understand behaviours within my management team as institutionalizing and subsequently organizational learning.

The fourth phase of the 4I (Crossan et al, 1999) process is institutionalizing. According to Crossan et al (1999) institutionalizing is the sign of that organizational learning has happened and is measured by having structures in place to leverage learning of the individuals. The structures create the context for interactions between the individuals and as in my suggested brain metaphor (p. 30) creates the interaction, which results in the increased organizational intelligence. Crossan et al's (1999) assumptions are that the exchange dynamics creates more than the sum of knowledge of its individuals. The exchange and constant creation of shared meanings results in structures, procedures and routines where the learning is embedded (Crossan et al, 1999). It can be suggested that the institutionalizing provides the structures for the organizational learning based on the organizational ambidexterity (March, 1991; Birkinshaw and Gibson, 2004) that regulates the tension between exploitation and exploration. I find it important to notice that the mechanisms of learning do not stop despite that institutionalizing is the last phase in the 4I model. Institutionalizing becomes the basis for further new practices derived from the constant cycles of learning (Aponte and Zapta, 2013), which seems to be the mechanisms within Crossan et al's (1999) seemingly linear 4I learning model. The dynamics related to institutionalizing is suggested to go beyond the organization and that networking and interaction outside the organization (inter-organization) support the development of strategic renewal (Pyrko and Dörfler, 2013). This observation resonates with the dynamics described by Jones and Macpherson (2006) as intertwining. It can be suggested that the mechanisms are looping back to the individual level and intuiting. This leads me to think of Crossan et al's (1999) 4I learning model as a circle instead of the original linear progression. The dynamics resonates with Berends and Lammers (2010) use of the 4I model in their research on discontinuity of organizational learning. Berends and Lammers (2010) discussions on interruptions and discontinuation of learning suggests a mechanism consisting of many interconnected learning-cycles, which could be creating a progressing learning trajectory or an overall learning cycle. In a progressing perspective the learning cycles must be linked in a spiralling mechanism.

I find in Crossan et al's (2011) reflections on the development on the original 4I framework as an acknowledgement of that further contributions have been beneficial to create further learning. Crossan et al (2011) have in their review identified how other researchers have relied on the 4I framework with their own theoretical lenses and in this way been contributing to the extension of the original works. It can be suggested that Crossan et al (2011) in this way respects the mechanisms described within their own framework, however, without creating an adjusted model. This leads me to stay true to the original 4I model during my research.

2.6 Summary on literature review

The review of the literature has shown that during the past thirty years there has been an increasing interest in contributing to the discourses around organizational learning. The area has been a fertile ground for the creation of constructs trying to explain the development within organizational learning or to provide answers to needs for renewal within the industry. Many constructs have over the years been developed and it has been questioned if the many constructs are offering new answers to same old problems (Huczynski, 2006). Crossan et al (2011) has been particularly clear in their criticisms by suggesting that the many constructs are creating more complexity to the already ill-defined domain and argues for strengthening of the theory. However, Zollo and Winther (2002) suggests improved effectiveness through a pattern of collective activities and modifications under the umbrella of organizational learning. Thus, the objective of my research will focus on changing operations in my organization based on constructs already existing. The research question can be:

How can the construct of organizational learning become integrated within daily activities leveraging the organizational performance?

The insight gained during the literature review has given rise to question if we have been able to articulate the problem we want solved and if we have been able to define the piece of information needed to improve the performance of our businesses. The closest I came to an answer was in Crossan et al (1999) and Macpherson and Jones' (2008) argument that strategic renewal is the absolute outcome of organizational learning. I agree to the argument that learning in itself is not the purpose of organizational learning, but rather the sustained competitiveness of the organization. The perspective can be seen to create a purpose for learning and a direction for the literature. Thus, the question I will ask as part of my research is:

How can I enhance the performance in the LMIOIP network of manufacturing units in a constantly changing business environment?

With the focus on strategic renewal and the historical development in mind I tend to incline towards seeing the many constructs as an evolution. An example is within our own organization in Novo Nordisk where we work on improving by assimilating new and better practices while still maintaining the predictability by a strong set of standardized and institutionalized processes. Changes are often driven by individuals being inspired from outside Novo Nordisk, or per intuition, which shows our learning starts with the individuals. The later assimilation of improvements and the outcome as improved performance also shows that organizational learning has happened through transformation processes including the creation of a common understanding and adaptation. I agree in this way to that organizations build an intelligence based on the learning of individuals, a perspective that also came clear to me in the creation of the "regulation system" representing the learning model (fig. 6).

The “regulation system” created an understanding of the balancing of the tension between exploitation and exploration. During the work with the “regulation system” I realized that this dilemma of exploitation or exploration is maybe the most dominant discourse throughout all the articles reviewed and maybe based on a lack of understanding. It was already in the literature argued by March (1991) that we as humans had difficulties in linking cause and effect related to explorative activities. But I also believe that the simplification of the dilemma by looking for inspiration within the discipline of regulation engineering has created an understanding of the balancing and which factors are involved. The ambidexterity leads me to consider the following research question:

How can I create a conscious strategy for balancing exploitative and explorative initiatives, and what competences are required within LMIOP?

During the literature review “three learning schools” was created by combining Leavitt (2011) and Senge (1990) work on learning models. The practical implication of the three learning schools is the co-existence of models and that each of the models contributes to the complementary element that I will define as organizational learning (see fig. 8). The creation of the learning school model has resulted in the following research question:

How do I apply the elements of the three schools to create an intersection for organizational learning?

The literature review also created insights to the importance of metaphors as enablers for organizational learning. Macpherson and Jones’ (2008) arguments made it possible for me to place the “virtual factory” and my vision of building “intelligence” by using the brain as metaphor of the organization. The insights have created an understanding of the power embedded in the use of metaphors, which will be further explored during my further research. The question could be:

How can I utilize the power of artefacts, objects, and metaphors to strengthen the feed-forward in the balanced learning model?

The review of the literature has created an overview of the different philosophies and constructs, which allows me to create a vision of organizational learning in a broader perspective. The use of organizational intelligence, as a pragmatic definition of all the organizational learning elements, can be argued to create less conceptual restrictions to my further research. The overview can also be suggested to have changed the focus of the thesis. The purpose of the focus on organizational learning had from the outset been to increase the performance of my organization. However, the insight created during my learning-in-action has changed the focus towards strategic renewal as the means to performance and long-term sustainability. However, the question is:

How do I ensure that my change process will prepare the organization for mastering strategic renewal as means to sustained competitiveness?

The literature review has created an awareness of the meta-competences (Anderson et al, 2015) needed in the implementation of the virtual factory. The review also allowed a sharpening of the research purpose, since I discovered the “question to ask”. The focus on organizational sustainability does not alone pass through the exploitative use of performance management, but also through strategic renewal. The supportive research questions raised within this summary section can be suggested as action oriented and related to applied research.

3.0 Methodology and methods

The methodology choice must have practical relevance since my objective is to engage in a change process within my own organization. This relates to the timeliness in findings and implementation of the changes, and how well the methodology embraces the world of my practice.

3.1 Ontology, epistemology and methodology.

The approach to the research is based on my personal dissatisfaction with what I see as low utilization of the installed brain power within the organizations I have been leading. I have for a number of years been curious about how to change what I perceived as reality. The DBA program provided me with the insights and the opportunity to further investigate the phenomenon. With my acquired insights I saw an opportunity to create changes when I in the spring of 2016 started as leader of a newly established organization. I had the insights from the preparation courses and I could link this new knowledge to the situation in my practice and I wanted to show that improvements could be made from applying new ways of thinking. I was looking for a solution to a specific problem, which would involve my colleagues. With this in mind, Easterby-Smith et al (2012) suggests applied research and consequently action research as methodology to obtain the best understanding of the dynamics within the organization.

As part of these early considerations on which methods to apply in my investigations I was considering whether I had a conscious ontological stance or if I was following the way I had been trained? Furthermore, I experienced some confusion when trying to distinct between ontology and epistemology. I found that focusing on methods and techniques came easier to me than my philosophical stance. My focus on the methods and techniques can be suggested to cover the main part of the methodology section and which, can be said to be the visible part of my research but also depending on my assumptions about ontology, epistemology and methodology. The focus on methods comes from compliance with academic rigour, which I find can be translated into transparency. This allows the reader to understand the way to my conclusions and as Gioia et al (2012) argues, for the reader to find conclusions plausible and defensible.

I can suggest that my past education and my practice within natural science have created an ontological stance in the field of realism. However, my stance is that it is never possible to obtain full objectivity since my experiments will impact the phenomenon investigated. I will be dependent on the interaction between the agents who can be suggested to create the reality, which also is seen in the systems thinking (Stacey, 2011). I see the reality as the outcome of what by everyone is seen as rational in the situation. In this way I do not say that individuals react in a fully rational way but rather that individuals react to what in the situation is rational. This leads me to consider the social context of behaviour and my own

subjective position. Easterby-Smith et al (2012) suggests that my ontological perspective could indicate an inclination towards relativism, however, with roots in realism.

My confusion in stance can also be seen related to the epistemological positions of positivism and social constructionism. My background in natural science makes positivism appealing since knowledge is only significant if based on observations (Easterby-Smith, 2012). However, being internal researcher prevent me from being independent from what is being observed, "I am part of the problem". My activity and research within my practice is related to the social construction and becomes meaningful from the individual's interaction. Easterby-Smith et al (2012) suggests that social constructionism focuses on the ways that people make sense of the world through sharing of experiences. This perspective can be suggested to resonate with my idea of knowledge creation through organizational learning, based on the creation of a common language. My aim is to create understanding of the situation and from the data to create new ideas as input to further research cycles and changes. I see this approach more aligned with the social constructionism than the testing of hypotheses as seen in positivism.

I do not hold any extremist position and accepts multiple data sources, which can be obtained from my position as internal researcher and leader of the organization. Furthermore, by applying action research I am searching for a solution to a problem by driving a change, not testing a hypothesis or developing theory. What can be seen as seeking compromises is by Easterby-Smith et al (2012) made explicit in critical realism, which recognizes the consequences of social conditions and that social life is generated by actions of individuals and have an external impact on them. I find that the described critical approach to status quo and the eclectic approach to research methods resonate with the ideas for action research and my suggested different sources of data.

In the search for methodologies creating knowledge usable in my practice, and a method where the inclusion of both researcher and the collaboration with the employees within the organization, action research as described by Coghlan and Brannick (2010) seemed a suitable choice. This choice also brings me in formal compliance with the requirements to the Liverpool University DBA Thesis (Liverpool, 2017). Furthermore, it can be argued that action research is a well-described topic; Coghlan and Brannick's (2010), Burns (2007), and Greenwood and Levin (2007) have all been providing insights to what they consider as good action research, which allows for a pragmatic approach in forming and applying methods. This thinking is well aligned with Gioia et al (2012) who argues that limitations to traditional approaches is the strong roots in what we already know and, in this way, limiting what we can know. We tend to elaborate on known constructs instead of the less well-defined concepts (Gioia et al, 2012). I will argue that this viewpoint supports the iterative and experimenting approach, which I find embedded in the change of operating that I had planned for the LMIOP

organization. It can be argued that applying action research is an explorative action balancing the dominant exploitation within my practice. It can be suggested that the choice of methodology reflects one of the main discourses from the literature review where the tension between exploitation and exploration is covered in the construct of organizational ambidexterity. Bjorkman and Sundgren (2005) suggest that action research aims to develop new and enhance local practices simultaneously, meaning I can use what is common knowledge and gain new insight with applied research. Action research can, in this perspective, be a lever of organizational learning by applying both the exploitative PSPS legacy system and the “virtual factory”, which I consider as an explorative concept.

The feature that distinguishes action research from other methodologies is that the role of the researcher is to actively intervene in the situation and thereby they expect to create a change (Huxham and Hibbert, 2008). In this way, progress and results of the research can be unpredictable as opposed to the more traditional verification of hypotheses. In their studies of insider action research, Roth et al (2007) suggests that the development of new capabilities requires a deep level of inquiry within the organization to understand the dynamics and culture. My approximately twenty years within the company in different managerial roles can be suggested to create this understanding. Roth et al (2007) also suggests that the contextual understanding will allow me to navigate in the political system of the organization so that the action research will be sustained.

The choice of action research as methodology influences the type of data and data collection process. The sources of data are divided into two main categories: Research cycles (described in section 3.2) and secondary sources (described in section 3.3). The research cycles are a well-described change management and data collecting process (Coghlan and Brannick, 2013; Burns, 2007) with the objective to connect observations of action back to the inquiry and bringing them into the future.

I have applied anonymity to all participants referenced in the analyses sections by creating coding. DM1 means Danish manager number one, AM means Algerian manager, IM means Iranian manager, RM means Russian manager, and CP means persons places outside the management teams but in central functions.

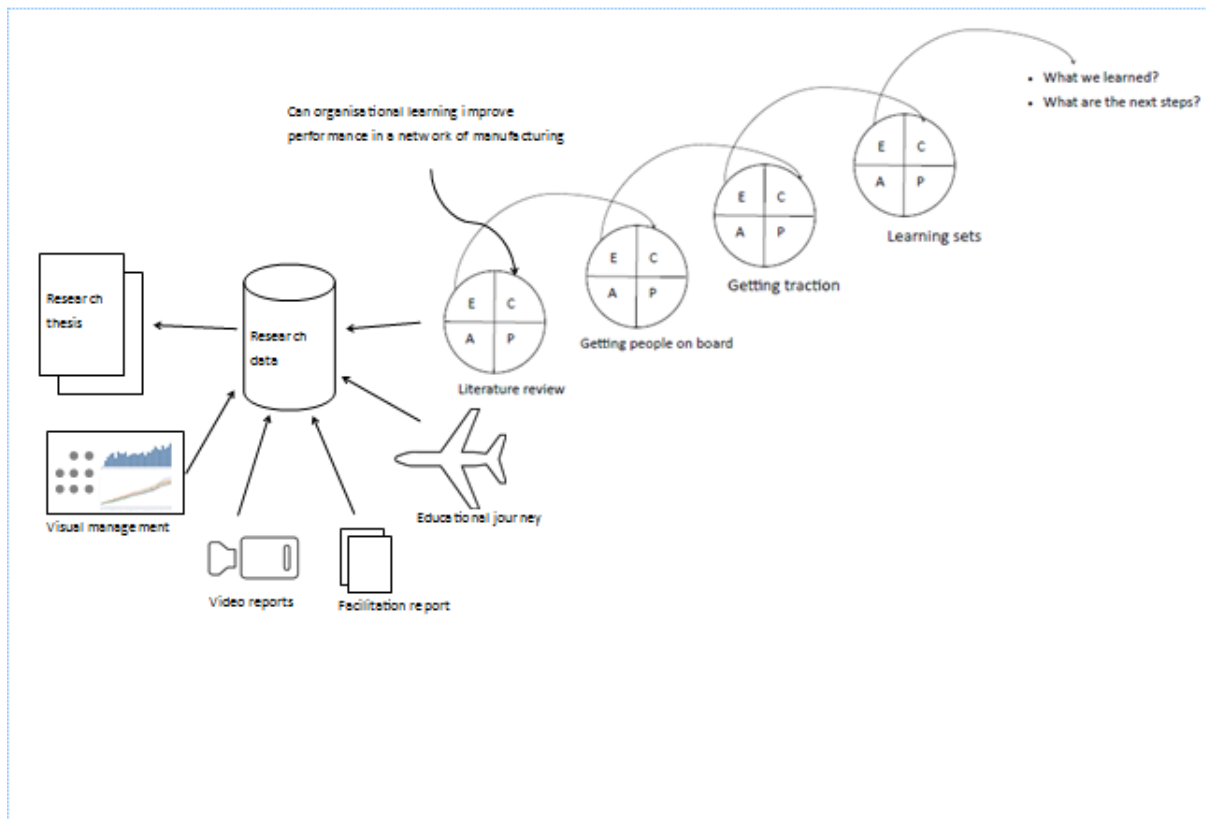


Figure 11 The full body of data sources

The figure indicates that the qualitative research covers multiple data sources (discussed in detail in later sections: 3.3.1 to 3.3.4), and that the heart of the research is the research cycles and the embedded search conferences, where I experience real-time accounts from the individuals experiencing the changes. The supporting activities like the learning sets and educational journeys create daily input and need to be captured and registered as research data.

The data is collected as observations and archived as notes in my research journal and noted as I experience the situation. I transferred the entries into a transcript to ease the analyses. Hereafter, I sorted the notes in a data structure related to themes that I systematically discovered from reviewing the data. I can suggest that my data entries in this way became drafts of the thesis writing. Later, during my research into methodologies, I came across Gioia et al's (2012) data structure model, which I found aligned with my initial approach, but also creating a further granulation to the structure by applying first order concepts (voice of the participants), second order themes (voice of the literature), and finally the creation of the aggregated dimensions. The aggregated dimensions are the headlines in the analysis sections.

The model creates a simple structure for the data analysis, but carries the downside of having a randomized approach, which I experienced as a problem during the initial data collection. I had no guiding principle for which patterns to look for. I investigated several models, hereunder King's

(2004) application of templates in the thematic analyses. I found the model goes beyond the random approach in its way of creating an initial hypothesis-based template. It can be said that the model resembles a “table of content” including the different sub-sections and in this way reflects the initial research questions. However, Willig (2013) argues that the categories will not capture the full essence of a concept and categories do not simply emerge from the data. The categorization could in this way be a “hypothesis” driven process, which I do not see in line with the principles of action research. The categories do not exist before the work of categorization and as such it is argued that they are constructed by the researcher (Willig, 2013). From searching in random pattern recognition and mind-mapping I found that more compelling to me, also because I have experienced these processes earlier. I am aware that my intuition will create a bias when randomly search for connections.

In the choice of presenting the data and conclusions as part of the thesis, I was inspired by Gioia et al’s (2012) suggestion that we tend only to elaborate on well-established constructs and in this way limit the advances in knowledge. Since I focus my research on creating a change in terms of learning I feel obliged to face the challenge of trying new ways, which has been leading me towards auto-ethnography. I will not apply auto-ethnography as overall methodology, but I find the writing style and the pragmatism well-aligned with the principles in action research. Since the literature (Ellis et al, 2011; Mendez, 2013) suggests that the topic is controversial within the academic world, I have chosen to dedicate a section to elaborate on my choice.

3.2 Auto-ethnography as chosen writing style

As earlier stated, I feel challenged by Gioia et al’s (2012) suggestion that advances in knowledge is limited due to our strong adherence to what we already know and in this perspective our exploitation on institutionalized methodology. My research theme is related to the creation of an explorative thinking mode to increase knowledge and performance, which drives me towards taking this “medicine” myself. Auto-ethnography is by Creswell (2013) argued to be writing and recordings by the individual who is subject to the research. I will as part of the organization be seen both as researcher and subject to the investigation, which makes it relevant to apply a critiquing approach to the self in the social context.

Auto-ethnography was until recently an unknown territory for me, but the increased insight gained through the research has opened this corridor of knowledge. Auto-ethnography can be suggested to hold many similarities towards action research (see fig. 12) and in this perspective the two concepts can be seen mutually supportive.

Action research	Auto-ethnography
Pragmatic	Pragmatic
Researcher is actively involved	Recordings by individual being part of investigation
Reflective on own practice	Involved within the organization
Collaborative research	

Figure 12 Similarities between action research and auto-ethnography

The insights gained have also raised concerns about the rigour and academic acceptance of the methodology. I find the concerns mainly related to claims lacking data support and the researcher's reliability as source when being involved in the phenomenon investigated (Ellis et al, 2011; Mendez, 2013). My objective is to apply the writing style since I agree to Ellis et al's (2011) suggestion that researchers can use personal experience to illustrate facets of cultural experience and in this way making characteristics of a company culture familiar for outsiders. The same argument is found related to the advantages of insiders doing action research. Roth et al (2007) suggests that the insider has advantages over the outsider in the greater depth of knowledge about the organizational resources. The argumentation for writing in the auto-ethnographic style can also be seen supported in Ellis et al (2011) and Mendez' (2013) suggestion that the social context must be considered and not see the researchers existing in isolation. This will allow me to reflect on my own experience, both as member of the investigated organization and as insider doing action research. I also find the approach in line with the requirements in the DBA Thesis handbook (Liverpool, 2017), where it is stated that the student must demonstrate engagement with practice and reflexively articulate how the student has developed through the project.

The pit-falls that I find described in the literature (Ellis et al, 2011; Mendez, 2013) are related to the trustworthiness of the researcher and the interpretations of the observed situations. The assumption in qualitative research is that the reality and the truth is constructed in the action and interaction between individuals and the context (Mendez, 2013). In the current context I act as leader and researcher within own organization and in that way, I have a voice in the perception of situations. However, the position as researcher is a situation where I am alone and biased by my pre-knowledge. The situation can raise questions both regarding trustworthiness and ethics. Mendez (2013) suggests that the researcher's inner feelings and thoughts could jeopardize the required honesty and willingness to self-disclosure, which can be critical when I am alone doing the research and the originator of the "virtual factory". This concern can be seen valid both in the leading the changes, collecting data, and the analyses of the observations. The perspective is raised in relation to the categorization of data and the choice of Gioia et al's (2012) methodology. The review by participating colleagues and the research supervisor can help me in avoiding my personal biases but will also raise a question related to ethics since the individuals will be capable of recognizing situations and involved participants, even that

those are kept anonymous. Such situations could result in discussions regarding the historical situation and in this way the honesty and value of the research. It will be of importance that my research involves more sources of information as seen on figure 12 and that I apply reflexivity in the write-up to ensure disclosure of my own involvement and to avoid that the thesis becomes focused on own experiences.

3.3 Learning in action

One of the practical methods of collecting data when doing action research is the research cycles. The method is based on Kolb's Learning Cycle from 1984, which has been re-constructed to fit the purpose of the different perspectives on action research. In the following research I have decided to apply Coghlan and Brannick's (2010) version of the research cycle, as indicated in fig. 13 below.

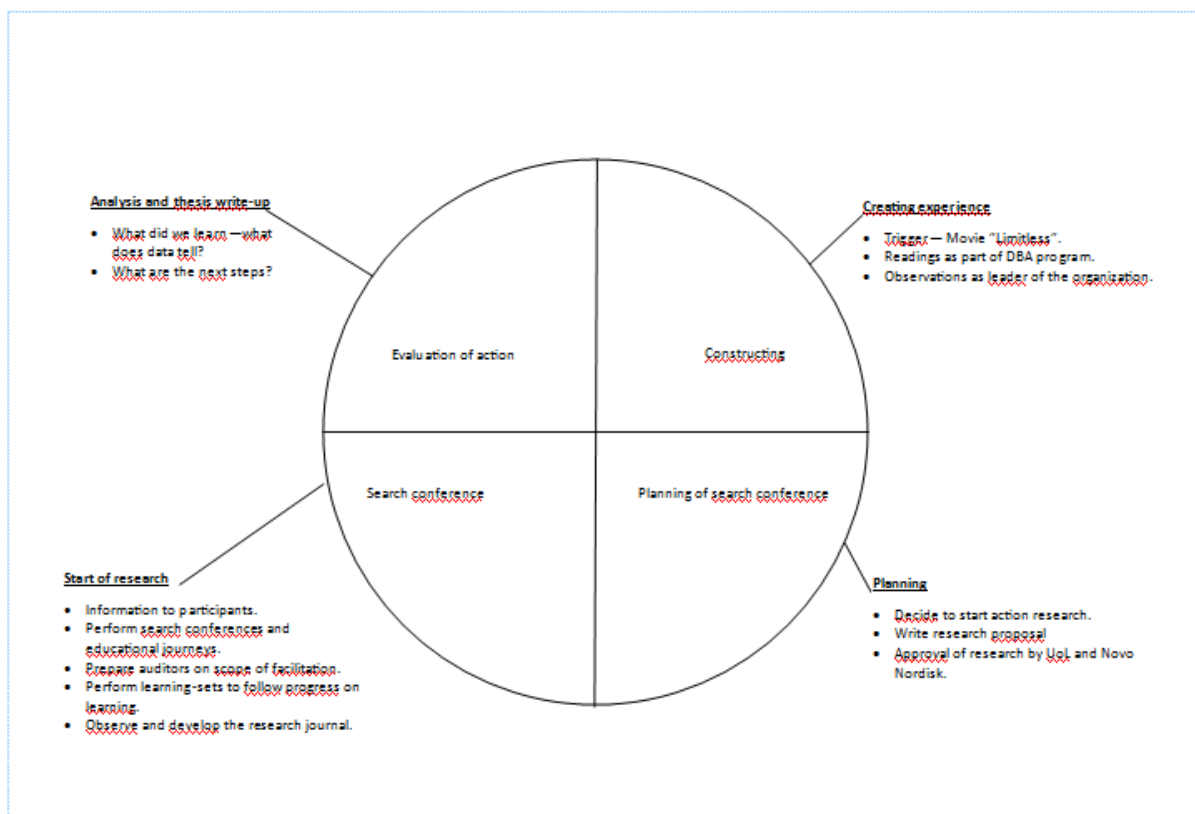


Figure 13 The overall research cycle

Coghlan and Brannick's (2010) model starts with a construction of what the issue might be, and in this way creates the basis for the actions to be taken. The constructing will change from cycle to cycle since events from previous actions will provide new meaning to the issue. The exploration of the issue during the construction results in the planning of action within the context being object of the construction. Actions are taken, and the events and outcome are evaluated. Actions must be simple, and it must be possible to observe the results even that I as researcher and leader also will be

participant in the action to create changes. I risk being involved to a degree that I might not observe and take note of elements being relevant as a data point.

The evaluation phase covers both the process of action and a sense-making of what happened. It is about interpretation the events and understands relationships. In this phase of the research cycle the integration of knowledge gained during the literature review becomes important to frame and explain events. The data consist to a significant extent on observation that I have recorded in the research journal as it arose in the natural course of discourse and behaviour in the practice of the organization. Last, but not least, the evaluation phase also is intended to create insights for the further research as input to the next constructing phase. In a learning perspective the research cycles could resemble the 4I learning trajectory as created by Crossan et al (1999). My personal development throughout the research can in this way be suggested to be captured in Crossan et al's (1999) construct and will be discussed as part of my conclusion.

The four research cycles cover two distinct different methods: Literature review and search conferences. The literature review is by Anderson et al (2015) argued to have the purpose to gather data and is as such similar to other research cycles and can according to the authors be considered as a separate cycle. The iterative process of the literature review fully qualifies to be represented in the four stages of the research cycle. The search conference is a knowledge generation method and is by Greenwood and Levin (2007) suggested to be a situation where the involved individuals are engaged in structured knowledge generation. During the further insights from the literature I discovered Roos and Victor's (1999) research on strategy-making, which can be suggested to apply similar principles as described in Greenwood and Levin's (2007) concept for search conferences. Greenwood and Levin (2007) argue the method is a process where participants are helped to learn by doing and constantly experimenting by creating a situation where the participants engage in knowledge generation. The search conference can be argued to be the social context in which learning can occur (Easterby-Smith, 1997).

The literature often describes action research as an iterative process. As examples Easterby-Smith et al (2012) suggest that action researchers must assume that social phenomena are continually changing and that this dynamic should resist researchers from making assumptions before the project. Alternative interpretations are suggested to emerge when pre-understanding is suppressed. The perspective can be suggested to challenge my pre-selection of four research cycles to be performed as part of my research. Could my approach have installed a bias from the outset of the research? However, as suggested by Greenwood and Levin (2007) I had planned the first research cycle as the literature review with the purpose to increase my insights to the research topic and the discipline of action research. The new knowledge obtained made me revise the research cycles that had been planned as part of my approved research proposal. This

change of plans suggests an iteration of my methods based on more precise understanding of the topic and the research methodology. More precisely it was the understanding of the search conferences (Greenwood and Levin, 2007) that created a need for revision of the planned cycles. The appliance of the search conferences as a research method required planning of the activities due to the logistic set-up of engaging with participants in different physical locations (Russia, Algeria and Denmark). The rigidity imposed by the choice of method and logistics can be suggested to be a trade-off towards what I saw as an opportunity by introducing events as part of the learning (Morgan, 2006; Easterby-Smith et al, 2012) and change process. Furthermore, the planning of the search conferences as a learning and data gathering process did not mean that the elements of action were pre-cooked before knowledge of the previous research cycle had been evaluated. The planning of the last research cycle (learning sets) was also triggered by the knowledge gained about the sustainability of knowledge related to the search conferences (Greenwood and Levin, 2007). The research cycle could in this way be a planned re-vitalizing activity within the planned change process. The described process leads me to suggest that I in my research thinking had been true to the action research process.

As a catalyst to release new ways of thinking I decided to introduce the tool “Lego Serious Play”, a method that I have seen at several previous occasions being an enabler of creativity, and as such it was a decision built on own previous experience. The tool is created by the Lego Group and the goal is to create creative thinking using metaphors and as such a process well aligned with my own appliance of the “virtual factory” and the utilization of the human brain as metaphor for the organization. Lego Serious Play is a facilitated process where the visual models built in Lego bricks are used to facilitate a dialogue and learning process. Said et al (2001) argues that the use of semiotics, like the Lego Serious Play, is a strong enabler in experimental learning and organizational processes. Systems like the Lego Serious Play are suggested to embrace the capacity for intensive communicative interactions (Said et al, 2001). The use of Lego as media to release creative thinking was also suggested by Roos and Victor (1999) in the research on strategy-making. Based on my own experience from practice and new insights from the academic literature (Frick et al, 2013; Roos and Victor, 1999; Said et al, 2001) I found Lego Serious Play sufficiently well described to apply the methods as enabler of creative and explorative thinking during the search conferences. The appliance of Lego Serious Play included the presence of a certified facilitator during the event.

3.3.1 Research cycle “literature review”

The literature review is by Easterby-Smith et al (2012) suggested to be a discovery of what is already known in a particular field and provide a basic understanding of how the topic has developed over time. In reality the literature review started as part of the research proposal. The data which informed the conceptualization of the research on organizational learning

was predominantly derived from the literature review and from a simple search string principle. When starting the literature search I was focusing on gaining an overview on organizational learning as topic. From that approach I created a schematic development of the topic over time and in relation to the industrial development in general. The review created an overview and understanding of common constructs and trends used under the “umbrella” of organizational learning. Since it can be argued that the literature review is a data collection phase (Anderson et al, 2015), I defined this work as the first research cycle (fig. 14).

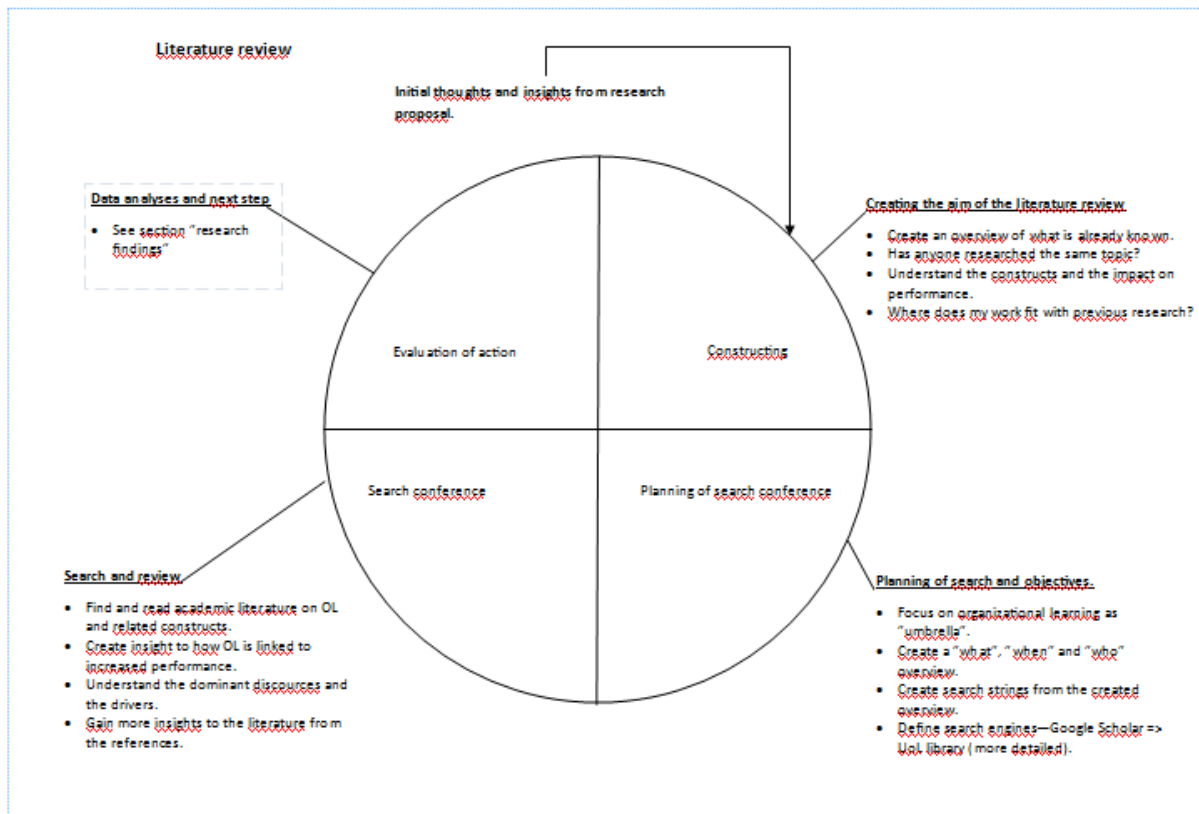


Figure 14 Research cycle on the literature review

In the action part of my literature review I translated some of the insights into models (The three learning schools and the balanced learning model), which I expect will become of assistance in the later stages to understand my observations.

The data collected during the literature review was organized in the different constructs and following transcript into section 2.0 Literature review. However, as argued by Easterby-Smith et al (2012) the review seems to continue through the research and thesis writing, which was seen in the creation of insights to the choice of methodology and methods. The literature on search conferences (Greenwood and Levin, 2007; Roos and Victor, 1999) was added to my knowledge and initiated the idea of applying Lego Serious Play. The concept was found described by Said et al (2001) and Frick et al (2013). The assumption is that metaphors become enablers of learning through exploration and storytelling. Frick et al (2013) suggest that

metaphors contribute to production, deconstruction and transformation of organizational values and beliefs. This perspective resonates with the literature (Crossan et al, 1999; Said et al, 2001) describing the use of metaphors as an aid to the individuals in the phase of interpretation of intuition and in the communication to others. It is suggested that metaphors become the link from individual insights to a shared group interpretation especially when no literal language exist (Crossan et al, 1999; Said et al, 2001; Sadler-Smith, 2016). This leads me to suggest that the appliance of metaphors is an enabling factor within Crossan et al's (1999) 4I learning model and it seems to include both the individual knowledge and conversion to group level.

Antle et al (2009) further suggests metaphors creates an even deeper understanding than linguistic conversations. This was seen in the studies related to the humans understanding of computer interfaces where it could be seen that where metaphors involve an interaction with concepts the systems were perceived easier to use. This perspective could say something about the appeal of the metaphors and how we understand the description of something where we do not have a language. The metaphor creates a bridge between the source and the target to express similarities (Sadler-Smith, 2016) and at the same time we apply filters to the understanding of that source and target is not the same (Yob, 2003). The metaphor can be suggested to be a path in meaning formation (Raidl and Lubart, 2001). From this understanding I will suggest that the use of metaphors links to the early phases (intuiting and interpreting) of Crossan et al's (1999) 4I model for organizational learning. However, this does not mean that metaphors are intuitions, but more likely to be the attempt to express intuition in relation to what could be known domain of knowledge. In this understanding and use of metaphors it was observed by Sadler-Smith (2016) that metaphors were used to describe the outcome (intuition) of intuiting and not the process itself. This resonates with Shrivastava (1983), Macpherson and Jones (2008) who suggests the metaphors as the common ground for the transition between individual level to the organizational level of organizational learning. I see the appliance of tools like Lego Serious Play as enabler of creation of metaphors, which in this way makes it relevant in my research as support to intuiting and interpreting by creating a "language". My purpose of applying Lego Serious Play is to stimulate the use of metaphors as a language and a way to convert tacit intuition into a tangible object that can be interpreted in a social context as suggested in Crossan et al's (1999) 4I model.

I can also suggest that the inspiration to apply metaphors comes from my own use of the brain metaphor early in my research proposal. Without knowing about the theory, I found the brain metaphor powerful as means to express what I wanted to obtain. I was trying to find a way to look at organizational learning in a broader perspective and have used the term "intelligence" as substitute for organizational learning since it has been unclear what was learning and what was sharing of knowledge. I found the inspiration in the movie "Limitless" and from reading Morgan's (2006) metaphors to see the organization as a human brain and the elements

included in organizational learning as organizational intelligence. The metaphor became a catalyst and started to make good sense since I could avoid thinking about if knowledge was generated, assimilated, or shared; it was still “intelligence” and it would improve the performance of the organization.

The transfer of information from a familiar domain to a new and unknown domain contains a risk related to the incompleteness embedded in the common understanding created (Morgan, 2006; Said et al, 2001). Metaphors cannot be self-explaining and can only be understood in the social context of dialogue (Said et al, 2001). This leads me to suggest that the objectivity in the analysis of metaphors is part of the context and cannot be separated also due to the applied filtering of meanings (Yob, 2003). Communicating an understanding created in a certain context contains a risk of misunderstanding (Morgan, 2006; Said et al, 2001), which leads me to suggest that use of metaphors within research requires a methodology where the researcher is an insider to understand and analyse the meanings and applied filters. Sadler-Smith (2016) suggests that metaphors is a means of understanding organizational life, which I find fulfilled in the research within my own organization.

The nature of the action research cycles seems constantly to open new routes to be investigated. In this perspective it can be suggested that the literature review is much more than the initial creation of overview and new insights and can be argued to be the constant link between my observations and the academic knowledge. Even more important the literature can be perceived as the catalyst making my research spiral forward towards an unknown objective. I can argue that the literature review was part of my personal learning trajectory and in this way also spiralling into new literature, which was added in the analysis phase to deal with emerging issues and surprises in the data.

3.3.2 Research cycle “Getting people on board”

“Getting people on board” was the second research cycle and the first cycle involving individuals from the LMIOP organization. The search conference (Greenwood and Levin, 2007; Roos and Victor, 1999) was based on the insights on organizational learning gained through the literature review. I anchored the structure of the conference in theories and constructs of organizational learning. One of the concerns about the search conference was if the sessions could create the right environment for learning to happen. The group invited was representing experienced people who had been in this part of the organization for a longer period and I had already experienced the tendency of “not invented here” thinking.

The participants are six managers (excluding the researcher) in senior positions, which include the head of the current production units as well as the projects of establishing new units. Four of the six participants were

placed in the same geographical location as me, which could create a skewed collaboration set-up at the event. The two participants not located in Denmark were based in Russia (Danish of origin) and Algeria (Algerian of origin).

The search conference was planned in collaboration with the area’s HR function and an external facilitator. The two-day search conference was organized away from the daily workplaces to ensure focus on the team and to create cohesiveness within this newly established team. As head of the unit my objective was to create a common understanding of the aspiration and to make the “virtual factory” the object. Furthermore, the objective was to learn to-learn-together (Senge, 1990) while testing the search conference as data collection method.

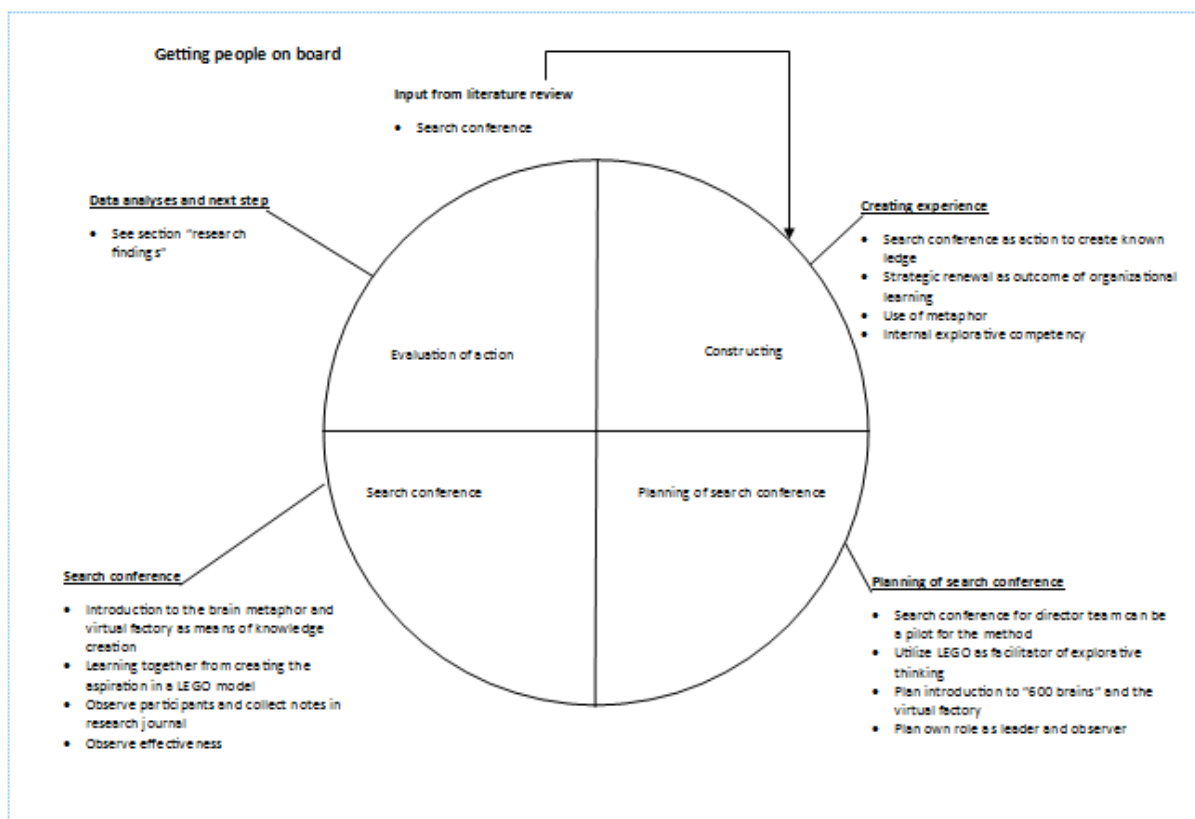


Figure 15 The first “search conference”.

The problem was defined as to create a sense-making common picture of the virtual factory. During the first day the scene was set as I in my role as leader of the organization presented the metaphor using the brain as example of the organization and in this way highlighted the need for interaction. I also presented the first ideas of the “virtual factory” and explained how I saw this way of organizing as a means to improve our competitiveness. The following activities were to express our own situation and desired situations. The activity was supported by applying Lego Serious Play to assist the individuals to express their thinking. On the second day the group was zooming in on the virtual factory and discussing the collective actions to build-on. The final part of the second day was dedicated to

collectively creating the image of the virtual factory as we see it in the near future.

Approximately one month after the first search conference the activities had increased to include two more major projects, which consequently increased the management team with three new members (from six to nine). As the new members, two Danish and one Algerian had no previous knowledge about the “virtual factory” and the constructed aspiration I found it necessary to establish a follow-up meeting with the full team. The meeting took place in Iran and included a presentation of the previous established model and a discussion of the “virtual factory” as platform for organizational learning and improved performance. The purpose of the meeting was to allow the new managers to assimilate the knowledge already created by the “old team” as represented in the Lego model. The idea can, with the later insights in mind, be seen to be following Akinci and Sadler-Smith’s (2018) argument that group experiences can be transferred to groups not participating in the original experience.

The sampling of data was in the form of observations to my research journal, photos from the process, and the Lego model created as representation of our aspiration. Furthermore, a video recording was made where the group explained the aspiration from the metaphors built into the Lego model.

3.3.3 Research cycle “Getting traction”

A second conference was performed including the five processes suggested by Greenwood and Levin (2007): a discourse aimed at sharing interpretations (done as warm-up round where the individuals build models of what they need and how they can contribute); development of a common vision; engaging the individuals in creating an action plan to reach the desired goals; creating a collective prioritization among actions; planning of specific actions, which will take form of pledges that each unit forwarded to me in my function as leader of the organization.

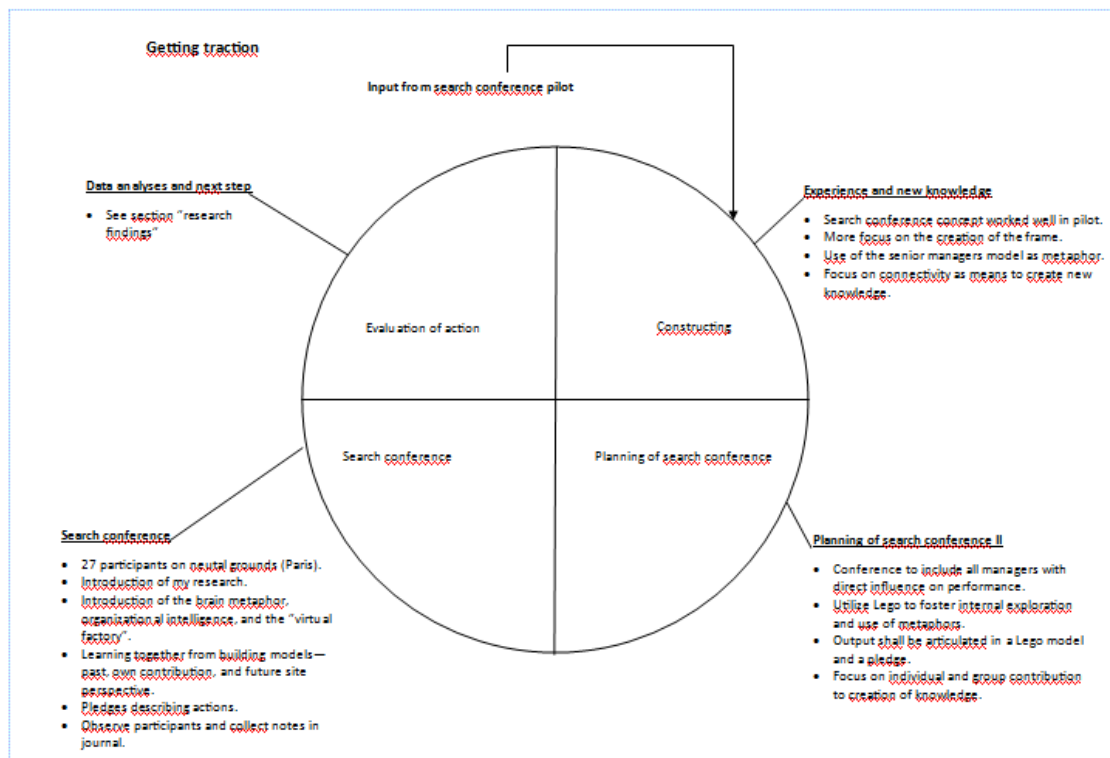


Figure 16 Search conference II

I selected participants for the second search conference based on their influence on the future roll-out of the virtual factory construct and as drivers of the connectivity creating new knowledge. The invited twenty-seven individuals are members of the first managerial layer at each unit. The managerial layer consists of managers with direct impact on project or manufacturing organizations.

The program for the search conference was developed together with the same external facilitator as used during the first search conference. Based on the experience from the first search conference I had decided that it would be me as leader of the organization who presented the idea of the virtual factory and the brain as metaphor. The external facilitator focused on the skills building in relation to Lego Serious Play. Thereafter, the individuals' review of past-to-present and present-to-future took place as a personal assessment of the aspiration and to which degree the individuals felt aligned with the aspiration. The individuals addressed strengths and weaknesses in the aspiration seen from their perspective. The individuals verbalized if they felt confident and where they saw the challenges.

Next the participants explored their competences and knowledge as an asset for the virtual factory. Everyone was building a model of the story of how they as individuals contribute to the realization of the aspiration, and what is needed to better contribute. The models were presented in plenum and secondly the individuals addressed what they needed from others to increase performance. The theoretical foundation was based on internal assimilation of knowledge from within the virtual factory. The first day of the search

conference had focus on the individuals and the creation of the common experience. The intended result was that by sharing the stories about the individual models a common sense-making and sharing of knowledge emerges. Crossan et al's (1999) suggest that this learning process is essential to move from individual to group level of learning.

The second day focused on the "from now to future". The brain metaphor was used when building the story of how we connect the six hundred individual brains across the virtual factory. I chose this introduction of the metaphor since Burns (2007) argues that images are crucial to sense-making in a participatory learning context. The image enhances the learning in situations like the search conference where conversational network is the core conduits for knowledge generation.

The task given to the managers was to create models for the journey to the future. The models must show concrete and actionable examples of how we improve organizational intelligence. All models were shared in plenum to ensure a common sense-making before the last leap forward towards a model created by each local management team. The model was intended to show what the virtual factory means to their unit and how it supports the model earlier created by the senior manager team. The models were explained by each management team and would later serve as the tool of communication at the local unit level. The search conference ends with action plans for each unit. The actions were articulated as a pledge and forwarded to me as leader of the organization.

The pledges were intended as an enabler of the continuation of the learning processes started at the search conference. My concerns were that the process started could be perceived as a single event and that the learning would be discontinued as suggested by Berends and Lammers (2010). My thinking at the time was that the pledges would serve as artefacts, which according to Shrivastava (1983) and Macpherson and Jones (2008) facilitates learning and institutionalizing of knowledge. The same expectations were related to the local organizations work with the year 2018 balanced scorecards, which also could be a timely opportunity to create an explicit commitment to the learning process. I had been envisioning how the reflections on the balanced scorecards could show a continuation of the linear learning process as suggested by Crossan et al (1999) in the 4I construct. Also, this shared action could according to Crossan et al (1999) provide a migration path to shared understanding. However, the downside of applying the pledges could create a peer pressure to accept a "shared understanding" and consequently not resulting in the coherent action as suggested by Crossan et al (1999).

Data compilation was done as observations, photos and notes taken to the research journal during the process. However, in the evaluation of the data I had to remind myself that I was a participant during the conference and that some of the notes might reflect my perception of the situation or the individual. Furthermore, the role as participating leader and researcher in a

large search conference might have made it impossible to capture all comments.

3.3.4 Research cycle “Learning sets”.

To support and sustain the search conferences, a number of “learning sets” were planned to capture learnings across the different units within the virtual factory and to facilitate changes to plans or Lego models. Learning sets were planned for each model built and in the following sequence and location: Assembly facility projects, in Copenhagen; Filling unit, in Russia; Tablet manufacturing unit, in Algeria. The sequencing was set to allow me to start with the perceived more mature group, and the group most open for challenges and dialogue. Expectations were that the less hierarchical structure of the project organizations would create the necessary context for the learning sets.

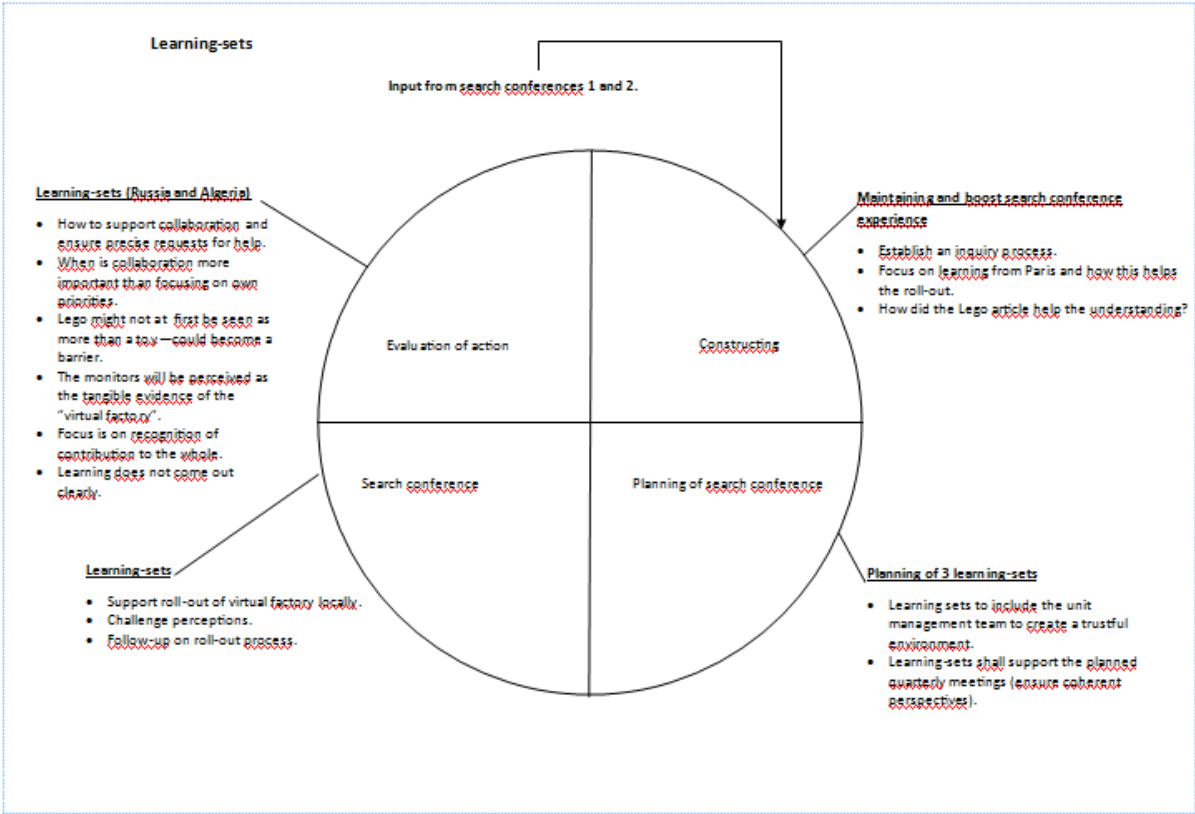


Figure 17 Learning sets

The learning sets were face-to-face. The purpose of the learning sets was to listen and ask questions to the process of creating traction and to learn about the progress on the pledges. The pledges, as can be seen below, came in different forms and with different understanding. However, the purpose of

the pledges is to create the base for a discussion and knowledge creation in the context of the learning set.

Action description	Deadline
1. Present to LMB project team the LMIOP management project Lego model	- Done for local team at 6 floor - Will be presented to LMB team W47 during project monthly meeting
2. Increase communication & interaction with LMIOP BS for ongoing review & mutual agreement	- Weekly meeting set up agreed with KIM and in place
3. Increase communication interaction with LMIOP BS for ongoing review & mutual agreement	- Weekly meeting with MOJH on the scope of FLIT processes & resource management
4. Assess the opportunity of conduct serious play Lego model workshop at LMB	- W52

Figure 18 Pledge from the project team

Following our leadership summit held in Paris last week, here below the main focus points that we need to translate into actions to reach LMTO aspiration:

1. Strong stand with union to encourage partnership that helps the employees.
2. Create strong network with LMK and share good practices.
3. Plan for celebrations and acknowledgement.
4. Define overarching training and development needs for LMTO.
5. Set clear KPIs for shop-floor (production & maintenance).

We will work together with MNG team and define clear actions, it has to be part of our BSC 2018 and related master plan.

Figure 19 Pledge from the tablet manufacturing management team in Algeria

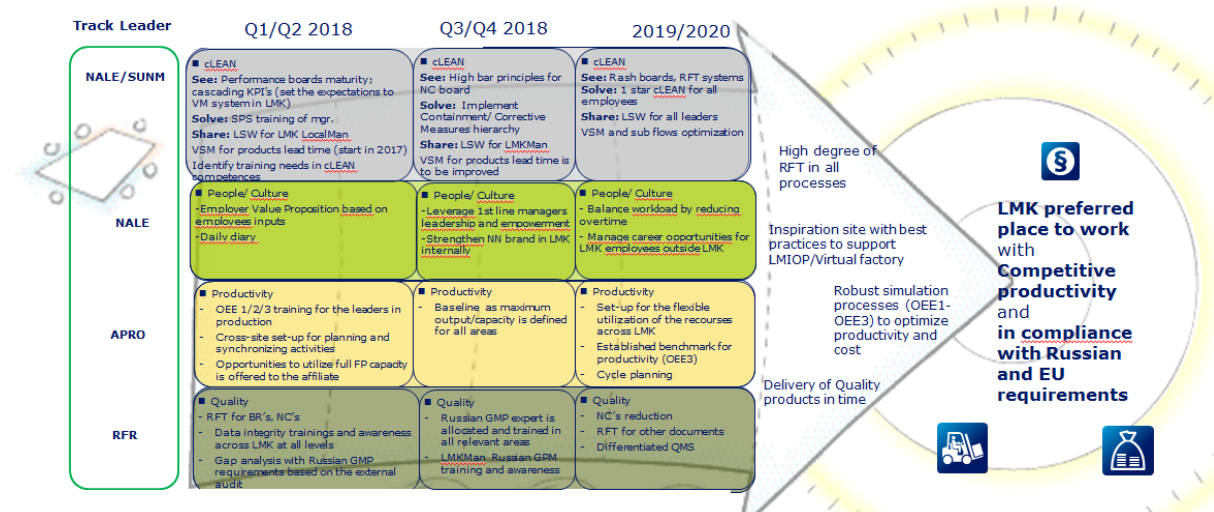


Figure 20 Pledge from the Russian unit

The learning set as data gathering method was inspired from the weekly learning sets applied as part of the taught modules in the DBA program at the University of Liverpool. Throughout the nine taught modules I have gained experience with the effectiveness of the learning sets as means to create reflection on both the result of actions and the learning obtained. I saw the learning set as a way to apply the social learning school perspective I had described in the literature review and to take Senge's (1990) suggestions on supporting explorative thinking and learning to-learn-together into practice. The experience on learning sets I gained through the DBA creates a context where I can run self-facilitated sessions. I also saw the self-facilitation as a less formal set-up staying within the trustful atmosphere of the daily colleagues and the familiar environment. Especially the trustful environment was one of the focus areas in Conklin et al's (2012) study of the use of action learning within the Canadian healthcare sector. The study includes an extensive orientation phase, but within a group of individuals who did not have any previous daily interaction. Hence, in my case, I was dealing with management teams who had daily practice together and it could be argued that the orientation phase would be of less value.

Mumford (1996) argues that the tendency within action learning is to focus on the action rather than the learning. The eagerness to work in real time on real issues can result in neglecting the process. Hill's (2000) critique of manufacturing managers' focus on short-term gains seems supportive to Mumford (1996). I will also suggest that our current performance management and reward system supports the exploitative perspectives, which could be explained from the anchoring within a manufacturing company. Mumford (1996) suggests that explicit attention must be paid to the behaviours encouraging learning from reviewing the experiences together with other participants. I have experienced this process during the preparation part of the DBA program where the participation in the learning sets encouraged an exchange and challenge of thinking. I also see elements in my practice where our appliance of systematic problem-solving and Kaizen events are encouraging the learning more than the action (Morgan, 2006). Since the objective of the change is to increase performance as result of organizational learning, I find the learning sets meaningful as response to Mumford's (1996) concerns. The learning sets create time for reflection, both for the teams, and for me as leader and researcher.

Data collected from the learning sets are in the form of observations noted in my research journal. During the sessions, the focus is especially on the awareness of learning and the development from first to second learning set.

3.4 Learning outside the research cycles

The learning and data sampling are predominantly related to the research cycles and my observations of the outcomes. However, the data collection process also includes educational journeys, and an internal audit called "facilitation". The processes could be argued to be research cycles

subordinating to the main cycles discussed in the previous sections. The evaluation phase in the sub-cycles would feed into the evaluations from the main cycles. However, my early planning and application of the secondary sources did not follow the full formal process for research cycles as described in the literature (Coghlan and Brannick, 2013). The methods are described in detail in the below sections.

3.4.1 Educational journeys

Two educational journeys were conducted. The participants were the managers in senior positions from the different units. The team, together with a moderator, spent time together visiting and discussing how manufacturing excellence as applied by the Maserati car manufacturer and visual control systems at FL Smith (a Danish company selling cement plants worldwide) can be applied in LMIOP. The theoretical support to the three journey days is founded in the knowledge creation by assimilating new knowledge from outside the Novo Nordisk organization. The journeys become part of the learning to-learn-together (Senge, 1990) principle since it can be argued that the learning comes both from the direct new knowledge seen at the visits, but also the learning that comes with the assistance from the moderator, that we acknowledge that we can acquire knowledge from outside. The perspective is further supported in Hoang and Rothaermel (2010) argumentation that the internal exploration competency is a necessary foundation to benefit from external experiences. The visits can be suggested to be a test of our search conferences' ability to work on our explorative competency.

The data from the educational journeys are observations done during the field trip and later references to insights gained through the visits. The observations are noted in my research journals. Photos were not used to support my notes due to the discretion of the visited companies.

3.4.2 Facilitation report

The facilitation report is considered a secondary source reporting results obtained through interviews of research participants, however, performed by auditors external to the research. The facilitation is an institutionalized "audit" process within Novo Nordisk. Facilitators, through their interviews of selected individuals, create a picture of how well Novo Nordisk values are embedded in our practice, and offer an investigation into more specific themes chosen by the manager of the organization. The specific theme was agreed to be the "virtual factory" and I had decided that participants in the search conferences would be interviewed by the facilitators.

Data comes as a facilitation report based on the semi-structured interview of managers and other randomly selected employees. The interviews included the elements related to the understanding of the virtual factory and a

measuring of the “temperature” on the roll-out. The interviews were performed as individual face-to-face and as video conferences. All respondents are anonymous in the report.

The interviews performed as part of the facilitation are not used as direct data points in the thesis. It is only the final facilitation report, which is a data point. In this way the facilitation process is not an action cycle in itself.

3.4.3 Video reports

Another outcome of the search conferences are videos where the constructed models and metaphors are explained by the builders. The videos serve as easy communication to the different manufacturing units and can be argued to assist in creating a common vision by assimilation. However, Bell and Davidson (2013) argues that the video as data sampling tool can be controversial in the academic context and seen less valuable than the linguistic version. My own experience shows that the semiotics effect of the visual representation is a good complement to the linguistic version and to the sense-making of the object. The sense-making becomes a collective learning process where the connectivity created through the explanation process both ensures the assimilation of the constructors thinking, but also might create new reflections due to questions raised. The assimilation of knowledge is not depending on the different individuals understanding of a text but becomes an interactive learning process.

Said et al (2001) suggests that use of metaphors cannot be self-explaining but needs the explanation of the creator to avoid misunderstandings, which makes the video recording relevant to the organizations. I agree with Bell and Davidson’s (2013) argument that the video cannot be used as representation of an object and as such the video is not considered as a data point within the thesis. Rather, it is used as tool in the explanation of the unit’s aspiration. The video recordings are added as links included in the thesis. However, due to the potential breach of anonymity from voice recognition I have chosen the sequence where I am “telling the story”. The same sequence was repeated with other participants speaking.

3.4.4 Visual management

The installation of the information systems related to the “virtual factory” is another technique where a cross organizational team of volunteers drive the process, which at the same time will become a learning process. The purpose is to visualize the status in the “virtual factory” at each of the manufacturing units and projects. Monitors were installed that will, for all employees, show the status on the installed production assets and the progress versus planned targets. The monitors also provide a “chat corner” where the employees could raise questions to their worldwide group of colleagues. The system is a tangible manifestation that the “virtual factory” and has gone

“live”. The visual management system is also the manifestation of the connectivity and sharing of knowledge. The data collection from the visual management system is related to the speed of adaptation and how well the system supports the exchange of information and knowledge, i.e. the number of “threads” posted.

3.4.5 Research timelines

The research and data collection process has taken place over a period of eighteen months and the activities are outlined in the table below (fig. 21). The table shows an extensive first literature review of sixteen months. However, this period also includes the literature review related to my first research proposal, which had been prepared in relation to a previous job position in France. Due to the change of job-position it was decided to revise my research focus to include the new responsibilities. The change took place from April 2016.

Research activities (data collection process)	Timing
Literature review: <ul style="list-style-type: none"> - First literature review related performance management, Chartres, France - Second initial literature review related to organizational learning, Copenhagen, Denmark 	December 2015 – June 2017
First search conference. <ul style="list-style-type: none"> - Creation of first aspiration model, Copenhagen, Denmark. - Follow-up meeting, Tehran, Iran. 	May 2017 – August 2017
First educational journey: <ul style="list-style-type: none"> - Visit to Maserati, car manufacturing, Turin, Italy. - Visit to F.L. Smith, management of cement plants, Copenhagen, Denmark. 	October 2017
Second search conference. <ul style="list-style-type: none"> - Creation of site specific aspirations, Paris, France. - Follow-up on pledges, Copenhagen, Denmark. - Facilitation report, Copenhagen, Denmark. 	October 2017 – December 2017
The three learning sets. <ul style="list-style-type: none"> - Project group, Denmark - Manufacturing, Russia - Manufacturing, Algeria 	February 2018 – March 2018
Second LMIOP aspiration model <ul style="list-style-type: none"> - Revised aspiration with new management team, Copenhagen, Denmark. 	April 2018
Second educational journey: <ul style="list-style-type: none"> - Visit to Bosch manufacturing facilities, Germany 	July, 2018

Figure 21 Research and data collection process.

3.5 Presentation of data

The process is different from traditional qualitative research since the analysis was ongoing in parallel to data sampling and continuous literature review. Anderson et al (2015) suggests that the analysis preparation often is undervalued by action researchers. The perspective can be created by the nature of action research, where the researcher works in an iterative modus and risk to not carefully investigate what to do with the collected data. Creswell (2013) suggests that the approach is often criticized for being intuitive, soft and relativistic. However, I find that the process resonates well the intentions within action research and building on the idea of using increased insight to propel further search for evidence. The process resonates with Anderson et al (2015) who suggests that data analysis is an ongoing process at all stages of the action research cycles. The dilemma seems to be embedded the action research and academic rigour. The process requires clear purpose and description of the analysis from the early start of the research cycles. This means a clear research purpose (section 1.2) and following clear purpose for each research cycle as defined in the constructing phase (fig. 15, fig. 16, fig. 17).

Creswell (2013) suggests that the core elements of qualitative data analysis is the condensing of data by coding, combining of codes into themes or categories, displaying data, and lastly comparing data. This method resonates with my own approach, which in a simple way can be described in the following three steps:

Siloes of data => Harmonized data => Cognitive evaluation

The first two steps refer to the research and data structuring, and the last part refers to the analysis and concluding part of my research thesis. Going from the silos to the harmonized data required much reading of the data transcripts before it was possible to make sense of the totality of data. This was also a phase where the continued literature review became an important element in understanding the observations and to relate the relevant literature. For example, Akinci and Sadler-Smith's (2018) research of the police force, Sadler-Smith's (2016) research on intuiting and Frick et al's (2013) white paper on Lego Serious Play became a source of new insights. How would my observations capture intuiting, which in its nature is linked to an individual processing? Following suggestions from the various researchers I will observe intuiting when the individuals build their answers in Lego (Frick et al, 2013), when I observe use of metaphors (Sadler-Smith, 2016), and when actions are taken based on recognition of a pattern (Sadler-Smith, 2016). Furthermore, I will be looking for ways that individuals might express intuition, which according to Sadler-Smith's (2016) intuiting-intuition-implementing model should indicate intuiting had been ongoing. These expressions could be statements related to feelings like "my guts tell me", and "I just feel right / wrong about this". Examples experienced during the search conferences could be suggested as: the tiger and kitten metaphor

as recognition of amplified complexity, the situation where DM5 presented feelings in terms of the figure detached from the organization (emotional state). The examples will be further discussed in relation to the data presentations. Observations can also include the collective intuition (Akinci and Sadler-Smith, 2018), which is especially relevant in the construction of the shared aspiration model. Will the construction elements stand unchallenged or will the process include interpreting? The unchallenged construction could be an indication of collective intuition where the participants intuitively understand the meanings of what is constructed. An example can be the senior management’s construction of the aspiration model where it could be questioned if the same result had been obtained without the prior reflection rounds? The construction seemed to be based on legacy understanding and as suggested by Berends and Lammers (2010) a temporal structuring with a group of very senior managers. However, not all metaphors are related to the intuiting phase. The interpreting and integrating will result in refined ideas and implementable solutions, which also can be observed as metaphors.

The analysis process is show in the diagram below (fig. 22).

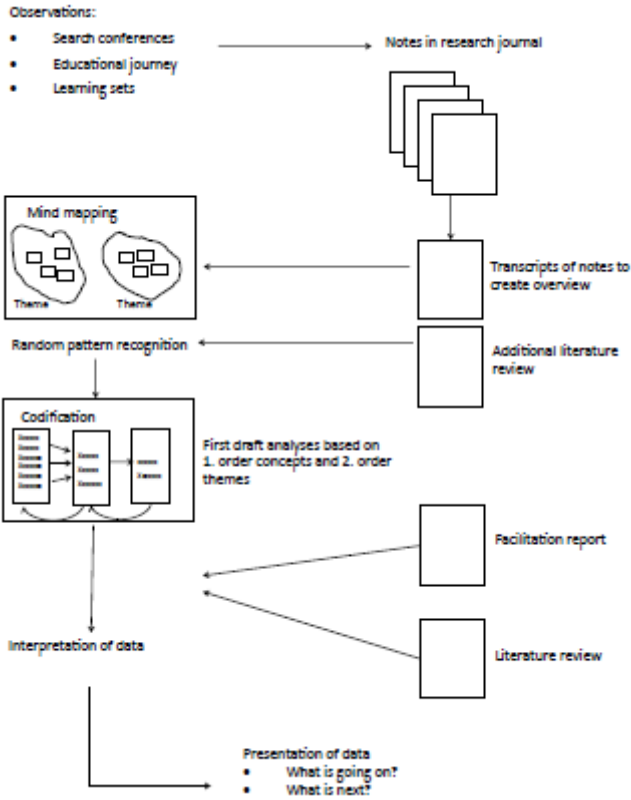


Figure 22 Routing of the performed data analyses

The analysis was based on the entries in the research journal and organized in a “mind-mapping” structure as seen in figure 24. Creswell (2013) suggest that data analysis is custom-built and revised when necessary. This position resonates with the mind-mapping structures applied during the analysis.

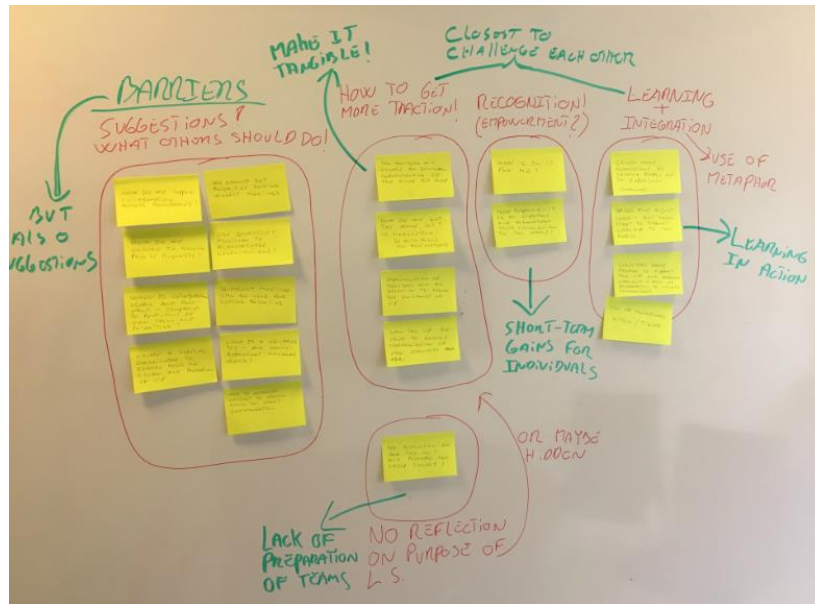


Figure 23 The process of random “mind-mapping”.

Using the mind-mapping principle allowed me to structure without being limited by pre-defined structures and constructs, which could result in missed themes. The findings were hereafter introduced in Gioia et al’s (2012) coding system as first order concepts. The raw-data has now undergone several “filtrations” from what was said or observed to become a concept. Hereafter, the concepts are linked to related themes from the literature. This idea is suggested by Gioia et al (2012) to see if themes can be suggested from the concepts (part of my mind-mapping) that might help to explain the observation. The second order themes are further distilled to aggregated dimensions. However, to create the aggregated dimension I had to make the first draft analyses based on the first order concepts and the second order themes. The insights from the draft analyses created the necessary knowledge to define the aggregated dimensions. Capturing the relations between the second order themes was a difficult and lengthy process, which required more abstract reflections.

The whole process was triggering a process of going back in the literature review, new literature, and other supporting documentation (facilitation report) to find precedents, which could support the findings. This phase can be argued to become a second literature review and a phase of the research where I experienced the difficulties of being the only researcher. The dialogue with fellow researchers could be suggested to ensure the qualification of the data structuring. However, I have during the analysis process been discussing my findings with especially DM1 and DM3 who are closely related to me in my daily practice. It can be suggested that these individuals have allowed for some sparring that I have been missing as being the only researcher. Furthermore, DM3 has been reading the full draft of my thesis. The involvement of the participants does not mean that I have adapted my

observations to what the individuals retrospectively think was happening. What is listed as “voice of the participants” is in fact my observations and understanding of the situation.

The coding represents what I was experiencing during the actions. However, the mind-mapping process can be suggested to be sub-consciously influenced from my early problem definitions or constructs from the literature review. Furthermore, surprising information, where unexpected patterns are discovered, was requiring further literature research to make sense of the observation and to create the themes. It can as such be argued that the analysis is partly descriptive as I describe what I see from the data and partly diagnostic. However, the codification and data structure are a static picture (Gioia et al, 2012) of the dynamics observed. The coding templates are located in each of the analysis’s sections (4.2; 5.2; 6.2) where the structuring of data created the writing sequencing.

The full process from research journal to final codification was lengthy and iterative in the dynamics of going back and forth to refine the categories. An example of the process is shown in fig. 24 below.

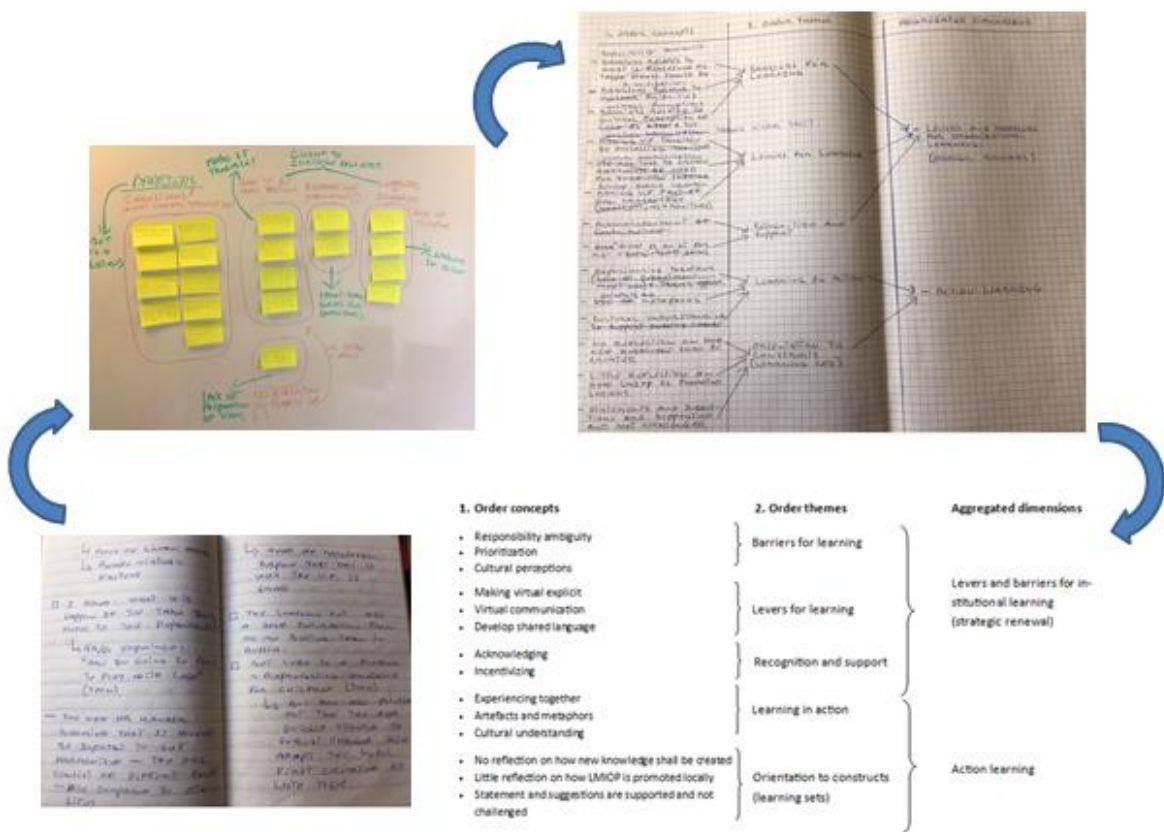


Figure 24 From research journal to structured data (learning-sets)

The final phase of the analysis is the presentation of the data, the “What is going on”, which will allow the write-up of the narrative where I focus on what the data means, and how to get forward from there, “What is next”. Each of the three analyses chapters ends with the “What is going on” perspective, which leads to the next research cycle and to the final

discussion and conclusion where the different findings are put into an overall perspective.

4.0 Getting people on board

The literature review had shown that influential members of organizations might become a barrier to organizational learning (Schilling and Kluge, 2009; Simon, 1994). Reflecting on the group of participants this could become a concern related to the creation of a learning-environment where we try to avoid a “not invented here” attitude and dependency on well-known ways of operating. I invited six members of the LMIOP management to the first search conference. All participants have long career histories and carriers of organizational memory and are a potential risk to block learning by applying known processes and solutions (Bapuji and Crossan, 2004).

The participants were: DM1, DM2, DM4, DM5, RM1, AM3, and me.

Approximately two months after the search conference I increased the management group from six to nine. The new participants were: DM3, AM1, and IM1.

4.1 What is in the data?

The section contains data from 1) the first search conference, 2) observations after the search conference. The latter part contains the follow-up meeting and the two educational journeys (Maserati in Italy and F.L. Smith in Denmark).

4.1.1 The first search conference.

Five of the six participants were familiar with Lego Serious Play as a moderator, which created an uneven experience in understanding and working with metaphors. However, Said et al (2001) suggest Lego to be intuitive and that mastery is quickly obtained. The “warm-up” could be suggested to create the safe environment, which Boud et al (2006) argues is an enabler for organizational learning. I was as such not concerned about AM3’s ability to contribute to the creation of knowledge.

I noted how the experience created during the warm-up allowed for fast assimilation and adjustment to ideas presented by the participants. I observed, throughout the construction phases, the exchange of ideas, which suggests creation of common understanding (Crossan et al, 1999; Senge, 1990). For example, DM1, DM2 and RM1’s creation of standardized manufacturing units based on DM1’s first application of pre-moulded Lego bricks as own first contribution. The use of metaphors facilitated the articulation of what was intuitive to the individuals and part of daily activities. The final aspiration (<https://sketchfab.com/models/d9527eb51fd145e6a9a766b05cc15daf>) came together in collaboration where the full team discussed and adjusted each element as the model was constructed. For example, DM5’s creation of

the development steps where the group created the joke “from headless to enlightened” based on that first step was showing a torso and last step a person with a light-bulb on the head. This sub-construction was also expanded by putting money in the hands of the “teacher” as result of the discussion of the importance of incentives and rewards. The construction was fast and without friction. The friction and scepticism that I had experienced during regular meetings did not occur during the constructions. At the time I saw the behaviour as sign of that we all were experimenting and in the same boat of learning. I noticed how each individual had specific focus areas. DM5 was focusing on the development of the individuals and added the sharks; however, stating that those could become dolphins if we understand the environment. DM2 had focus on the control tower and the collection of data. DM1 worked on the illustration of the manufacturing line where a clear link to PSPS was created via the constructed performance board (fig.25).

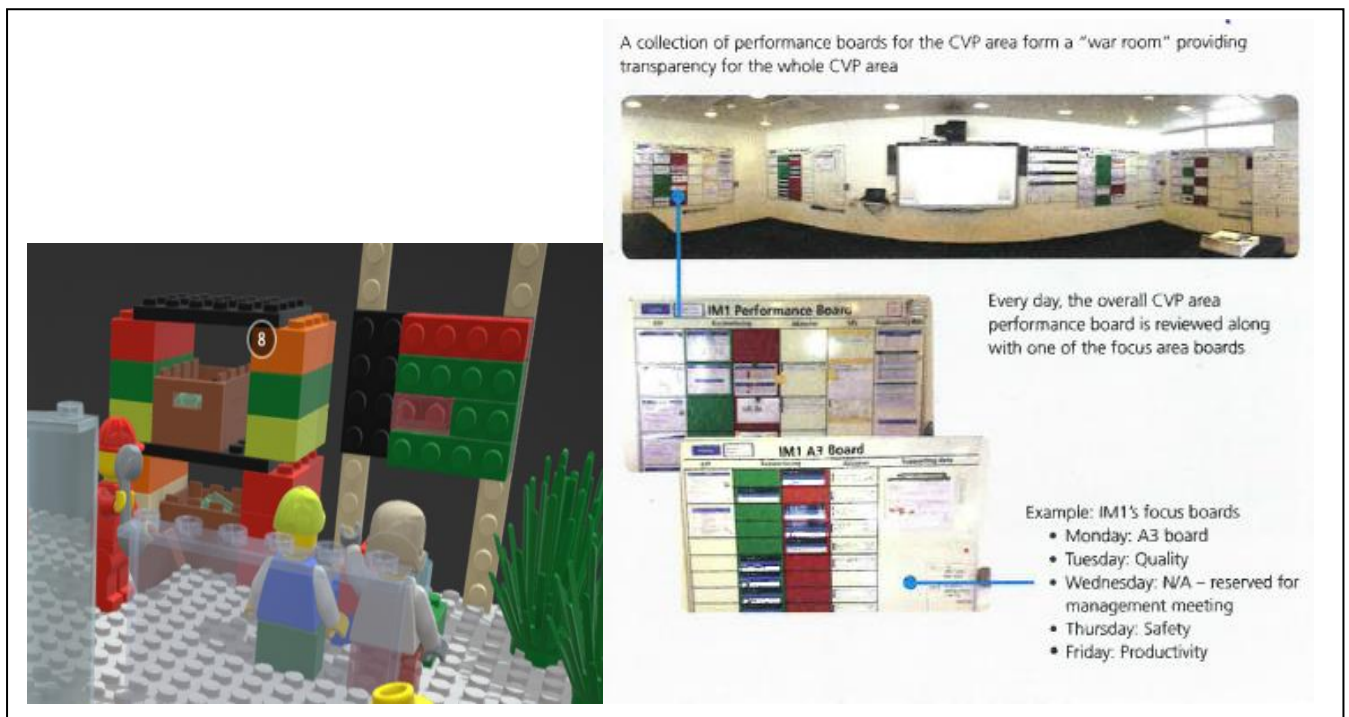


Figure 25 Performance boards from PSPS booklet to Lego representation

I noticed how DM1 had created a Lego imitation of what is presented in our PSPS booklet. DM1 also had a special interest in creating the project metaphors as standardized elements.

I noticed how everyone was focused around their own professional area, which especially was clear when DM4 added the magnifying glass to the projects as a representation of the quality assurance department (fig. 26).

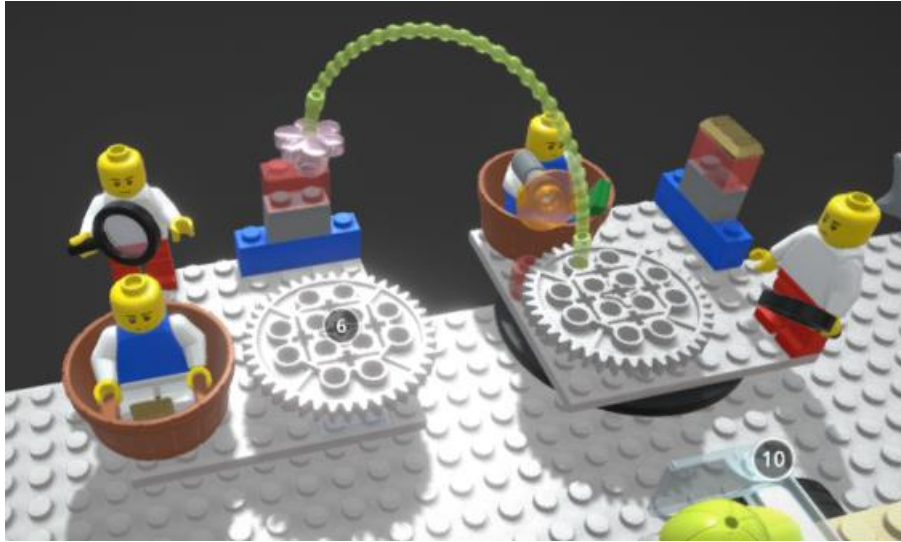


Figure 26 Standardized project execution with presence of the quality assurance

I noted that, as “owner” of the “virtual factory”, I was mostly working on the connectors and the guard-dogs. My reflections were at the time that this could be a way to show management support to explorative activities (Senge, 1990). I realize that due to the engagement I did not notice that AM3 who had least experience and being new to the group was very little active during the construction. It can be suggested that we fell victim to Schilling and Kluge (2009) and Simon’s (1994) suggestion that influential members of a group can become a barrier for learning or create peer pressure (we had not actively been seeking AM3’s contributions).



Figure 27 Organizational learning is exemplified in the connections, antennas, radios, and development staircase

The final model (fig. 27) shows an acknowledgement of that the organization operates in unknown territories (the sharks) and that communication in and out of the organization becomes important both for protection and promotion (the guard dogs). The importance of connectivity and sharing of information is exemplified through the large number of connector pipes, antennas, and radios found on the model. The two ladders to the tower signal that the full organization has access to all information. The participants found this latter part important as communication of that transparency should be a common platform for exchange of ideas across the organization. The focus on sharing information later became our interactive monitor system. The idea was to install interactive monitors in areas where all LMIOP employees were passing daily. This involved that all units had a monitor, in the network with other units, where all LMIOP production data is shown. The idea was to provide all employees with the opportunity to know the situation across the LMIOP organization (the “control tower”). At the same time, my idea was that the attached chat function would create a social context for fast and easy problem solving. The raft floating free in the model represents the input of new knowledge carried from central functions.

Parallel to the construction of the aspiration for LMIOP I realized that DM5 was creating a separate metaphor. It was a Lego person hanging in a string. DM5 was temporarily adding the metaphor to the aspiration model and then removed it again. At the time it was not clear to me what DM5 wanted to obtain from this behaviour. In parallel to the continued construction process I started an inquiry to DM5’s construction. It was explained that the figure represented DM5. However, the inquiry did not at the time reveal further thoughts, which could be related to that the group seemed to neglect DM5’s side-contributions. Furthermore, DM5 did not express any intentions to continue a dialogue on the topic but reverted to the main construction. At the time the situation did not make sense to me; however, I will revert to this particular situation and the link to the sharks versus dolphin metaphor in my discussion of metaphors as enablers.

4.1.2 Observations after the search conference:

As the team had been expanded to include three new members (IM1, DM3, AM1) I had arranged a follow-up meeting to ensure common understanding of the aspiration model. Especially the understanding of the applied metaphors would be of importance. Said et al (2001) suggests that the many possible meanings risk creating misunderstandings. Metaphors’ are not self-explaining and only creates meaning in the social context of dialogue (Said et al, 2001). This latter part was one of the learnings from the previous action cycle. For example, we did not understand DM5’s metaphor of sharks becoming dolphins.

The individuals (DM1, DM2, DM4, DM5, AM3, RM1) who had experienced the learning-in-action from constructing the aspiration model were now disclosing that the experience was more than an isolated event. Discussions were on how the knowledge sharing across the organization could be ensured. However, no explicit procedures had been created to define new ways of operating. This could make the concept stand weak in comparison with legacy systems. It can be suggested that the tacit knowledge among the six individuals is anchored in the aspiration model and in the change of vocabulary. For example, the “virtual factory” was referenced daily and the different elements of the construction were frequently explained as the model was exposed in the office. I reflected at the time that the internalizing could be the result of the dynamics between the senior managers during the construction of the aspiration and the intuition from their daily practice together. The experience was a surprise since I expected that the group having so much organizational memory could be difficult to get on board. I had expected a “not invented here” attitude, which could create barriers for the planned learning process (Bapuji and Crossan, 2004; Simon, 1994).

The enthusiasm among the individuals who had constructed the model was quickly assimilated by some of the new members of the team. DM3 had recently joined the team and had been part of the educational journeys. DM3 was now highly engaged in the idea behind the “virtual factory” and had become the driver of the interactive monitors and chat systems. Others were sceptical and challenging. For example, IM1 raised the question “What is the reason behind the Virtual Factory concept”?

IM1 was pointing to flaws in the different elements of the aspiration model where the legacy systems were providing clear guidance. IM1 was specifically interested in the specialist roles, which could be suggested as institutionalized structures within the legacy systems but not existing in the aspiration model. I observed the tension when DM1 became distracted from the challenges and started to question if it could be more attractive to stay with the current system as suggested by IM1.

The insight gained from Hoang and Rothaermel’s (2010) suggestion that internal explorative thinking would be needed to benefit from external experience had inspired me to organize the educational journeys visiting companies acknowledged for their performance and innovative use of information. During the visits at Maserati and F.L. Smith, the managers from LMIOP were showing curiosity and started an inquiry process related to how the systems and institutionalized concepts were further developed: i.e. did the organizations have systems in place to capture learning and improve. Furthermore, I noted how DM2 was engaging in the dialogue on what data would be important for the organization. During the debriefing after the visits the group was focused on how we could utilize what had been seen. I had invited an experienced manager and LEAN expert to participate at our visit and to facilitate our debriefing. My reflections were that this outsider perspective could help us to understand and qualify what we experienced. I did not hear any “not invented here” or “we are in a more complex industry”

attitude. I was also surprised to hear the discussion related to that the organizations visited were lacking systems to capture learning as a means to further develop their systems. The discussions were engaging in a learning perspective both in terms on how we could utilize this new knowledge and how little focus on learning the visited organizations were showing. The visits added to the organizational vocabulary and created ideas of how to further develop the virtual factory. The new ideas were paving the path for the appliance of virtual reality and creating ideas for the planned system of interactive monitors (fig. 28).

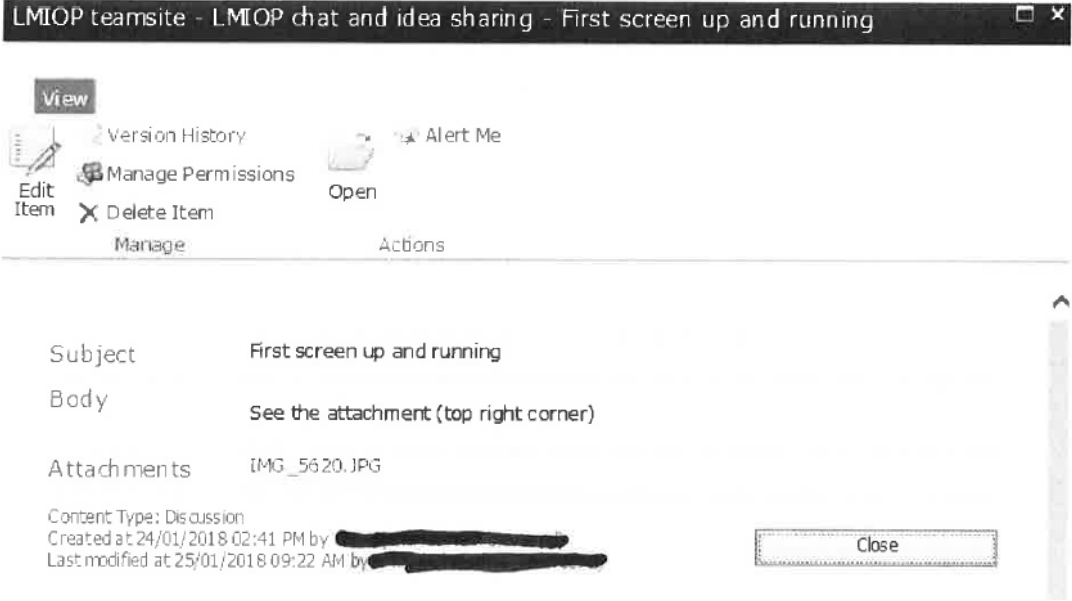


Figure 28 First test monitor established

4.2 Presentation of data

The first order concepts have been developing from being statements and observations to become concepts. The aggregated dimensions are hereafter presented with sections referring to the identified themes. After the analysis of each theme I have condensed insights in *italic*. The insights are later discussed in the “What is next” section.



Figure 29 Codification related to the first search conference

4.2.1 Organizational learning trajectory

Learning together through common experiences as a deliberate process is suggested to be evident from the construction of the aspiration. The process was iterative and facilitated by pre-defined tasks as the familiarization with Lego Serious Play. The process can be suggested in line with Senge's (1990) thinking of learning together from personal mastery, shared vision, and ability to act together. I also find that the observation resonates with Easterby-Smith et al (2012) and Easterby-Smith (1997) suggesting knowledge passed tacitly between individuals as natural dynamics within organizations. I expected that the experiment would create a common experience based on the concept of the three organizational learning schools discussed during the literature review (fig. 8). During the literature review I had suggested that organizational learning happens in the intersection between the cognitive, the behaviour, and the social schools (Leavitt, 2011; Senge, 1990). The mental models, created through experimenting and the social interaction with other participants, resulted in metaphors and artefacts (the standardized facilities, the performance boards, the sharks, the flowers). The content leads me to consider that our construction processes involved the elements creating the intersection of the learning schools (mental models, structures, experiments, action-oriented learning, support to explorative thinking, and the social context). The observations could suggest that the managers were starting to see the "virtual factory" as concept for creation of knowledge. For example, the educational journeys can be suggested to show the experiencing of a learning trajectory and the start of learning to-learn-together. The process resonates with Gherardi's (2001) network socially woven around a domain of knowledge. The event has

created the enactment where learning is happening in the local context of activities (Gherardi et al, 1998).

I see the metaphors as a tangible image of a stored experience from the legacy processes (the standardized elements representing manufacturing units and the tower representing the performance reporting) and showing the participants' perception of the organization and environment. Sadler-Smith (2016) suggest that metaphors can be the means of understanding organizational life, which leads me to consider the observations on the flowers, sharks, guard-dogs and connectors as representing intuition related to current experiences and further elaboration on how the future will connect the units through the virtual factory. Based on Said et al's (2001) argument that Lego releases creativity I suggest the intuition and metaphors influenced by the shapes found in the Lego. For example, the similar blocks were triggering thinking about standardization, the dogs created a recognition of that it would be needed to protect the organization from disturbances and the growing flowers were representing the aspiring new organizational climate. This leads me to consider that the intuition was strongly based on the daily practice and in this way could be suggested to indicate the recognition of patterns through intuiting. I observed how each individual added their specific part (DM1 the performance board and DM4's magnifying glass), which instantly was acknowledged by the rest of the group. We all recognized the represented situations but from each our path of experiences. In Akinci and Sadler-Smith (2018) perspective this behaviour can be seen as collective intuition based on common background and practice. Thus, this observation can be categorized as internalizing process, which by the authors is seen less rigid than the formal institutionalizing, but still signals organizational learning at the organizational level (Crossan et al, 1999).

The later assembled "whole", including the information connectors, can be suggested as explorative to the organization. The common understanding and exploitation of the PSPS elements developed in the social context can be creating a systemic "whole", which goes beyond the exploitation of the single PSPS element. I note that the sharing of performance data and better practices are part of the legacy systems. But I see the explorative and involving knowledge creation as new and part of the "virtual factory". Senge (1990) suggests that this activity creates a shift from seeing parts to seeing wholes and that individuals' move from being reactors to actively shaping the reality and the future as a group. This leads me to consider that the group was expanding the capacity to create a desired result, which could indicate elements from Senge's (1990) social school (fig. 8). Furthermore, I will suggest that the creation of the aspiration was an explorative working method in line with Hoang and Rothaermel's (2010) suggestion that internal exploration needs to be established before the organization can benefit from external experiences.

It can be argued that the dialogue on explaining the metaphor brings a recognized pattern or intuition from the individual cognitive level to the

social context of the group. This leads me to consider that the activity creates the enactment for the individuals to learn in the context (Gherardi et al, 1998). I perceived the group moving from the creation of multiple metaphors through dialogue and inquiry to improved and mutually understood metaphors. From the individual understanding and knowledge creation the construction evolved towards the collective action of putting it all together and seeing the whole. The inquiry and dialogue between the construction phases had created a shared understanding and collective mind (Crossan et al, 1999) to allow for the mutual adjustments. I have represented this development journey in figure 30, where in the final part of the process the construction of the artefact leads to a shared explanation of the aspirations represented in the model.

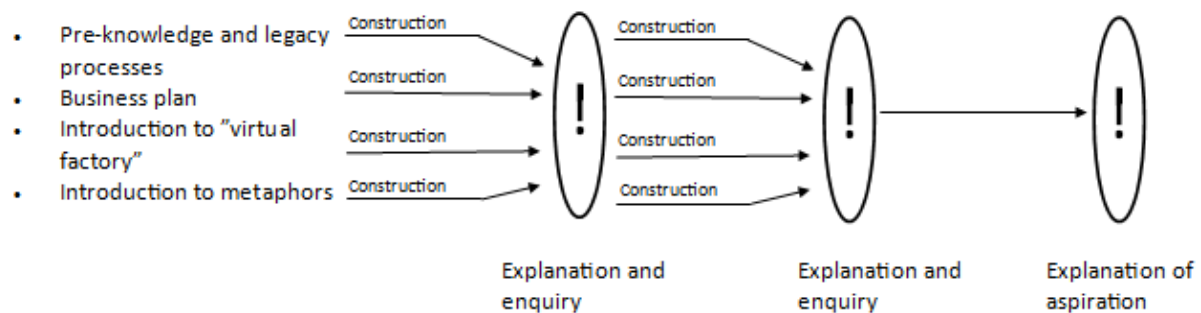


Figure 30 The process from inspiration to aspiration

During the first phases of intuition and interpreting I experienced a situation where the participants were creating and explaining the elements from the legacy systems. The “patient in the middle” and the daily deliveries represented by the warehouse stock and the truck was directly referring to the company vision and our balanced scorecard indicators (fig. 31).

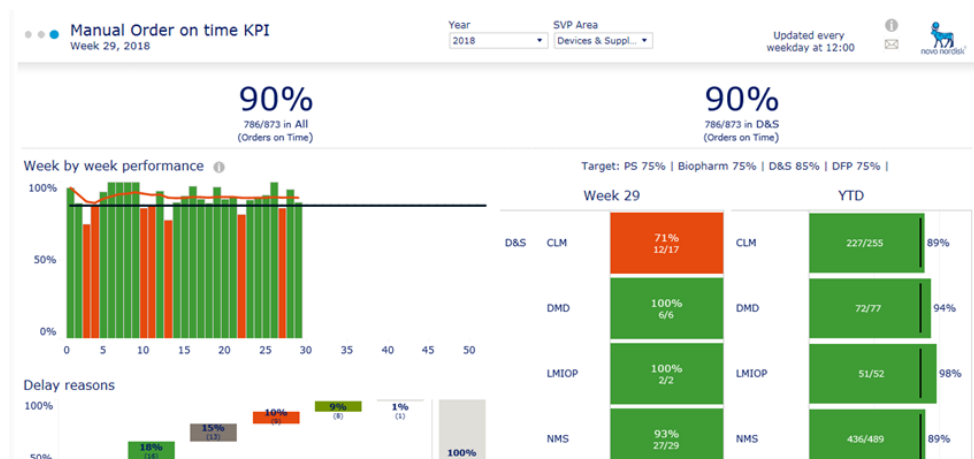


Figure 31 Example on balanced scorecard indicator

I can suggest that this dynamic show how the collective cognition (Akinci and Sadler-Smith, 2018) created through our daily interaction facilitates the learning process. This coherence can also be seen as the reason why it was difficult for AM3 to contribute to the “common” work and why it was a

frictionless construction of the final aspiration. During the presentations of the constructed models I observed several times how the presentations by AM3 were received with a lack of understanding and neglecting attitude. My initial assumption regarding AM3's ability to contribute despite less experience failed. Same dynamics was seen during the video recording. It was the same dominant members who were eager to explain. I also realize that I was the first to explain the "common" understanding of the aspiration model, which can be seen as creating peer pressure on my colleagues. In this perspective it can be questionable if common understanding had been obtained.

My reflections at the time were to show ownership as leader of the organization. However, I can also suggest that I had created the explanation seen from my perspective, which could have biased the "story". At the time I had not shown sufficiently reflexivity to be conscious about my influence on the participants "understanding" of the model. The observation can be argued to confirm Simon (1994) and Schilling and Kluge's (2009) concerns regarding the influential members of the organization blocking new information. However, a common understanding of the aspiration seemed obtained through the explanation by each participant
<https://www.youtube.com/watch?v=9DQMSGbID3U&feature=youtu.be>.

I reflected at the time that the explaining phase was a process confirmation, but I can also argue that the explanation was the element aligning the "story". Hence, it can be argued that the process has followed the learning trajectory suggested by Crossan et al (1999) where the aspiration model is a tangible evidence of the integrating phase (mutually agreed adjustments of parts).

It can be suggested that the development experienced in the search conference resonates with the ideas of Levitt (2011) and Senge (1990) as I combined in the three learning schools (section 2.4). The starting point is the mental models and understanding of situations (Leavitt's, 2011). This could be suggested seen in the early phases of responding to the pre-defined tasks. The experience built through experimenting and action-oriented learning with Lego is suggested in line with the behavioural school (Leavitt, 2011). And lastly the social interaction and support to explorative thinking (Senge, 1990) is created from the event structure. For example, the debriefing from the educational journeys did show an inquiring process and no suggestions about barriers related to our "complex" industry, which could be argued to indicate an internal explorative attitude (Hoang and Rothaermel, 2010). The cognitive learning through mental models (Leavitt, 2011) and the support to explorative thinking (Senge, 1990) as found in the pre-shaped Lego bricks can be argued to create a "jump-start" in guiding the participant's minds and alignment of thinking.

The frictionless constructions suggest that a collective intuition and institutionalized thinking already existed. The behaviour is by Senge (1990) suggested as mental models or ingrained assumptions about the practice

that influences the understanding of the organization and the environment. This can be seen as decisive for the way of taking action. For example, the organizations strong focus on standardization and indicator driven performance management (seen in DM1's focus on constructing dashboards). I can suggest that the observation from the search conference resonates with Akinci and Sadler-Smith's (2018) research on collective intuition within the police force leadership teams. The dominant logic from the collective cognition developed from the same training, similar practice, and social interaction is seen helpful to speed-up decision-making processes by anticipations. I noted the same phenomenon in the context of the small group of senior managers constructing the aspiration model. This behaviour can be suggested rooted in compliance behaviour from our business environment based on institutionalized processes and procedures (Leavitt, 2011; Simon, 1994).

The collective intuition can be argued to serve as a catalyst in the decision-making as Akinci and Sadler-Smith (2018) observed within the police forces. Consequently, I can suggest that like the observations in the police forces, the aspiration model risks being biased from the general organizational perception. Evidence can be suggested from the focus on the single parts (standard factories and performance boards), which individually represent the daily practice. The creation of the "whole" becomes a sub-conscious process and learning can be suggested to be "Thinking with the hands" as the known knowledge is connected. The perspective could be suggested to question the process of the search conference as an explorative process. Would we have built the same model without the warm-up exercises?

The influence from the legacy processes on the thinking and learning of the group can be suggested to be seen from the standardized manufacturing units and projects represented in the construction. When scrutinizing the different elements of the aspiration model I am surprised to see how much linkage I find to the PSPS. It can be suggested that the search conference mostly resulted in clarification and assimilation of known knowledge from the legacy systems. The process of learning-together could have made tacit knowledge explicit. This process was during the literature review found to be at the heart of knowledge creation (Nonaka, 1991; Nonaka and Takeuchi, 1995).



Figure 32 Standard production units with slight differences

In contrast to Nonaka (1991) and Nonaka and Takeuchi (1995), Senge (1990) suggests that organizational learning must include generative learning. This has created some confusion in my perspective of organizational learning since it could suggest that no organizational learning had happened within the LMIOP organization if I followed Senge’s (1990) definition strictly. However, during the literature review I concluded that organizational learning had to be considered in a broader definition. In section 2.3.3 I suggested organizational intelligence as an inclusive definition. I find that definition in line with organizational ambidexterity (March,1991; Crossan et al, 2011; Bapuji and Crossan, 2004; Birkinshaw and Gibson, 2004; Birkinshaw and Gupta, 2013) where the full learning is obtained from balancing exploitative and explorative activities.

Thus, in a learning trajectory perspective, as in Crossan et al’s (1999) 4I process, it can be argued that the institutionalized guidance to thinking acts as facilitator in the phases of intuiting, interpreting and integrating. The learning becomes a feed-back process measuring against what is already known and standardized. However, as seen in the construction phases the collective intuition (Akinci and Sadler-Smith, 2018) can be suggested a powerful feedforward process, which seemed to be driving the early phases of organizational learning. This can suggest that the individual part of the learning process is feed-forward; however, this is balanced in the feedback process of the social interaction in a compliance culture.

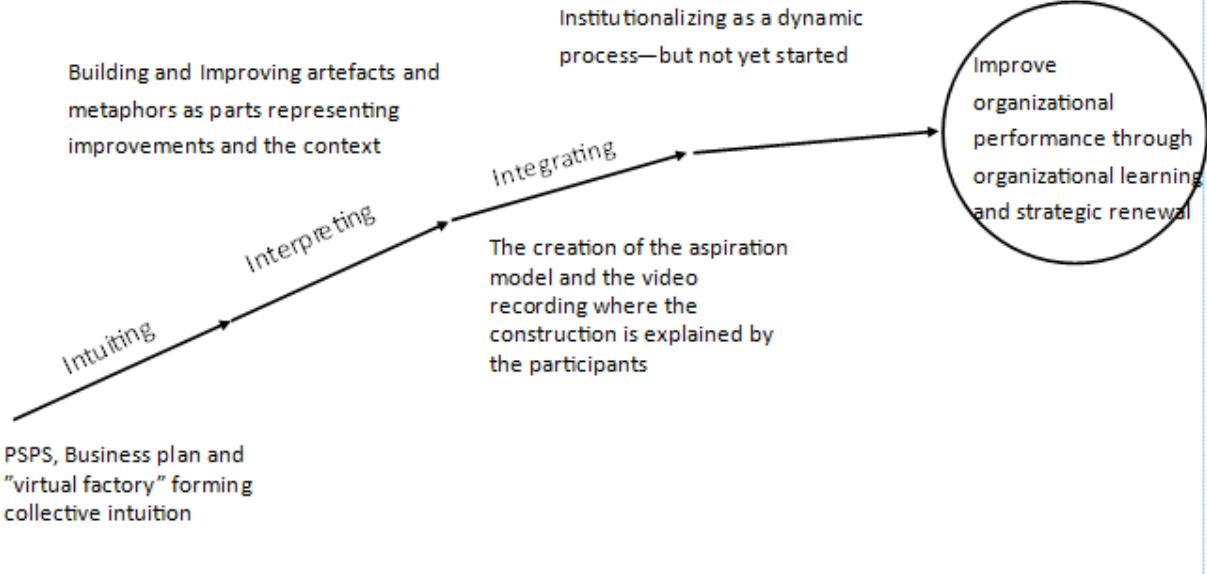


Figure 33 Standard production units with slight differences

The learning together had taken us to a phase where willingness was present to discuss new ways of talking about performance management. This inquiry process was started at the visits at Maserati and F.L.Smith. It can be argued that an internal explorative process had been started from the search conference and further supported from the external visits (Hoang and Rothaermel, 2010).

Insight 1: Intuition is influenced by the institutionalized processes (PSPS and D&S BP 2020) and pre-shaped bricks, whereas interpreting, integrating, are formed within the explorative context (search conference and Lego Serious Play).

Insight 2: The creation of parts and connecting the whole by thinking with the hands might sub-consciously create an understanding of the whole (making tacit knowledge explicit).

Insight 3: The 4I learning process as suggested by Crossan et al (1999) only focuses on knowledge creation. The knowledge is not evaluated to be right or wrong.

Lack of common experience is by Crossan et al (1999) and Berends and Lammers (2010) suggested as a disabler of the learning trajectory and were observed during the follow-up meeting. IM1 challenged the idea behind the “virtual factory” concept.

“What is the rationale for the virtual factory?”

“What are the measures of success?”

“How do we integrate the specialists within the virtual factory?”

At first, I felt somewhat irritated about the challenges. Then I recalled my role as leader and researcher and tried to take an observing position. Reflecting on my own behaviour I recognize the symptoms of internalizing and realized that the group and I had created beliefs based on our common experience. This inquiry could indicate that the experience from the experiment was not assimilated as easy as I had expected. I am wondering if the aspiration was biased beyond our conscience. I also recall that I was the first to explain the model. My expectations had been based on the internalizing that I perceived was the outcome from the search conference and Akinci and Sadler-Smith (2018) suggestion that internalization can facilitate the transfer of knowledge from those who experienced it to those who did not. However, this approach was not successful during the follow-up meeting. I experienced that at least IM1 did not assimilate the experience from the rest of the team and AM1 could be suggested doubtful. AM1 was, however, not explicit about the position. Could I as the first to explain the aspiration have hi-jacked the story?

Senge (1990) suggests that shared vision must be present for organizational learning to occur. The perspective can be related to learning as a cognitive process in a social context where the learner actively acquires information from others. IM1 was in the inquiry searching for answers and the challenge could be seen as across boundaries of the organization, which resulted in that DM1 felt uncomfortable in the situation. Dusya et al (2015) suggests that the boundaries can be fluid, which I suggest was the case of DM1 trying to accommodate IM1’s challenge. It can also be argued that DM1’s sign of uncertainty could suggest that being participant at the same event does not necessarily ensure same experience (DM1 had focused on the production

line, performance board and standardized projects) but might not have agreed to my story. DM1 had been the individual focusing on the legacy elements and maybe never really accepted the explorative perspectives. The situation can be suggested to resonate with Crossan and Berdrow's (2003) research on the Canadian Post where senior managers, due to their position, had their intuitive ideas pushed through.

Reverting to the three learning schools it can be suggested that both experimenting and social interaction was absent during the follow-up meeting. The new members were lacking experience from the construction. Their intuition and interpretation were influenced from the institutionalized legacy systems. I assumed earlier that this could become an advantage for the learning process, especially when supported from internalizing (Akinci and Sadler-Smith, 2018). However, the lack of common experience created a void, which sub-consciously was filled by the familiar legacy processes. This discovery suggests that the common understanding was related to a smaller group than expected and/or that the internalizing was more fragile than I had perceived. It can be argued that ambiguity interferes with our less conscious side and it can be suggested that the legacy systems take over.

Insight 4: Lack of common experience and language can hinder assimilation of otherwise internalized knowledge when the knowledge-holder and knowledge-receiver are physically distant.

4.2.2 Organizational legacy

Legacy processes were an identified theme since two of the new participants in the management team (IM1, RM1) come from organizations with strong roots in the existing PSPS methodology. Hence, it can be seen as a natural reaction to challenge new operating ways. Furthermore, the previous sections of analysis have shown general links between our behaviour and the legacy systems. Corley and Gioia (2003) suggest that new ways will require that new meanings are created for what was done before. Meanings can in this context be structures like the performance management system and balanced scorecards, which frames the operating and creates organizational identity.

The “virtual factory” can be suggested to represent the explorative journey where new processes need to be created as suggested above by Corley and Gioia (2003). I experienced the tension during the follow-up meeting when especially IM1 and RM1 frequently referenced the PSPS processes. I had not been ensuring short-term measurable objectives, which can be suggested to let the individual focus on what was already well-established. I noted from IM1's challenging questions that a “finished package” substituting the existing system had been the expectation. IM1 can be suggested in line with Corley and Gioia (2003) in the expectations of new meanings. Furthermore, I had not been clear in the communication that the legacy systems and the “virtual factory” should co-exist in organizational ambidexterity (March,

1991; Birkinshaw and Gibson, 2004). This leads me to consider that I had created a situation of ambiguity when not making clear how the combined systems would serve the units. I can suggest that IM1's challenge of the "virtual factory" by referring to elements from the legacy systems is a practical example on the conflicts between exploitative and explorative thinking.

It can be argued that the parts on the aspiration model mostly can be considered artefacts representing the current situation. Only the connectors, sharks, guard dogs and plants can be considered new metaphors representing intuition and the developing of new shared meanings. My observations lead me to consider that most of the learning cycles were related to our legacy processes, which shows the strength and influence of the exploitative activities. Drawing on the balanced learning model (fig. 6), it can be suggested that we were constructing based on a feed-back system and even further strengthening the system by making the internalizing explicit in terms of the aspiration model.

I was surprised to see how the business plan initiative number five (fig. 34) resonates with the standardization seen in the Lego model. The internalizing has become explicit through the constructed model and shows how the individuals are true to the framework. The strong legacy in the PSPS and the business plan can be argued to drive a collective intuiting successfully and consequently a non-deliberative solution to problems. For example, it can be suggested that the construction of the aspiration model happens by selecting Lego bricks representing the processes and solutions from the legacy systems. This leads me to consider that the organization is experiencing learning in the common understanding of what is already existing knowledge embedded in the legacies.



DAVID CREER
Australia
David has type 2 diabetes.

Initiatives

In order to succeed with our three focus areas; Robust, Ready and Effective we will drive eight strategic initiatives:

- 1 Drive **right first time** through standards and training
- 2 Improve **supplier integration** and oversight
- 3 Drive predictable and fast **ramp-up** of new lines
- 4 Design and deliver supply chain for **new products** and **new global sites**
- 5 Design and establish **local manufacturing set-up**
- 6 Optimise end-to-end supply chain **configuration** and **distribution**
- 7 Focus business through **outsourcing** and **offshoring**
- 8 Create **sustainable leadership** mindset

Figure 34 The Device and Supply Chain Management business plan

The standardization and feedback system ingrained in our way of operating is by Simon (1994) argued to slow-down or hinder organizational learning. However, the thinking within the legacy systems is the basis for the incremental improvement culture, which has become institutionalized within Toyota (TPS: Toyota Production System) and has in practice been proven effective both at Toyota as well as other companies world-wide. The successes can be argued to challenge Simon's (1994) argument.

A conflict in definition of organizational learning seem to exist between Simon (1994) and Nonaka (1991) and Nonaka and Takeuchi, (1995). However, during the literature review I created the pragmatic term "organizational intelligence", which covers both perspectives. It can be suggested that the mentioned successes are building on exploitation where Simon (1994) and Senge (1990) tends to focus on creation of new knowledge. The legacy systems can be suggested to increase the organizational intelligence from cross learning and ensuring that knowledge becomes embedded in all parts of the organization and relates to how Nonaka (1991) and Nonaka and Takeuchi, (1995) see organizational learning as making tacit knowledge explicit. I will argue that this phenomenon was experienced during the search conference where an internalizing of PSPS occurred through the common experience. However, I did not experience this process as deliberately since the objective was to let creativity loose and built our aspiration for the future. It can be suggested that the collective intuition (Akinci and Sadler-Smith, 2018) had taken control of our creativity and directed the event towards the legacy processes and organizational learning based on making knowledge explicit.

Insight 5: Organizations building on strong legacy processes creates compliance thinking, which negatively impacts feed-forward and double-loop thinking. However, strong legacy processes create the fundamentals for further learning.

Dominant organizational beliefs become legacies developed over years and carried by the individuals in the organization. It was discussed in the literature review that what senior managers find important will direct organizational learning (Simon, 1994; Leavitt, 2011) and consequently the organizational beliefs and self-perception.

I have in section 4.2.1 been discussing how the group of managers, working closely together in their daily practice, have been dominating the construction of the aspiration. The beliefs about the organization and the environment created within this group can, as suggested by Simon (1994), have been accepted by the other participants. Simon (1994) and Schilling and Kluge (2009) suggest that the behaviour could become a risk to the understanding of organization and environment by excluding input from new members of the organization. This could be the case when "forgetting" to ask for input from AM3 and the neglecting of DM5's creation of a parallel construction.

The same phenomenon can be suggested to have influenced the follow-up meeting. The discussions between managers from the original construction team were mostly related to how we could improve collaboration and connectivity. Akinci and Sadler-Smith (2018) suggest that internalizing could help transferring the experience from the construction phase. Here Akinci and Sadler-Smith (2018) conflicts with Simon (1994) and Schilling and Kluge (2009) who suggest that dominance risks blocking new input. Early at the meeting DM3 referenced the better practices seen at the educational journey to Maserati and suggested copying them to the LMIOP organization. Despite being new to the group this individual had been participating in the educational journeys and was physically located together with DM1, DM2, DM4, DM5 and me. It can be argued that DM3 have been part of the experience, which can be suggested to include DM3 in the internalizing. Furthermore, the dominance from the original group, and especially my own support of the concept, could have influenced AM1 who was also new to the organization. AM1 seemed to passively accept the “virtual factory” concept. Hence, it can be suggested that the conflicting perspectives between Akinci and Sadler-Smith (2018), Simon (1994) and Schilling and Kluge (2009) comes out inconclusively since it can be suggested that data shows evidence of both.

Insight 6: Dominant organizational beliefs carried by influential individuals risk creating a passive assimilation of the knowledge by the rest of the organization or new members.

4.2.3 Organizational structures

Berends and Lammers (2010) suggest that interruption to the learning trajectory can be caused by the internal organizational context and especially the tension between institutionalized learning from the past and new learning. This perspective is further strengthened by Schilling and Kluge (2009) suggesting that structures maintain mental models and assumptions about the organization as it was.

Responsibility ambiguity is related to how structural uncertainties were impacting individual behaviours. In addressing the organizational ambiguity, I am especially thinking about two different situations. One related to the search conference and one to the follow-up meeting. During the search conference it was the metaphor with the Lego figure in a string and at the follow-up meeting it was DM1’s uncertainty.

The structures for the “virtual factory” were not well-defined, and only partly outlined during the search conference. Evidence of structures can be seen in most elements used in the model. For example, the standardization, performance management, and the stepwise people management. It can be suggested that the learning seen in the construction of the aspiration model create values and beliefs. These will later be developed into procedures and structures as described in the business plan (fig. 34). The lack of fixed

structures and ambiguity was further complicated by the matrix reference of the HR function. This included that the function had its point of reference outside the LMIOP organization. The ambiguity resulted in the metaphor created by DM5 parallel to the aspiration model. The somewhat cynical behaviour of creating a metaphor of oneself hanging in a string sends a clear signal of not seeing oneself as part of the future organization.

The observation shows inconsistency between DM5's metaphor and the vision for the organization. This was despite that the specific role and responsibility of DM5 was explicit in the Lego model, "It is [DM5] handing money out as incentive for learning". DM5 was indicating that the role would have to be filled by another individual (and this has materialized in 2018). Schilling and Kluge (2009) suggests that a perception of restrictive management style and strict work rules will create barriers to individual intuition. The restrictive structures in the matrix were explicitly expressed by DM5 during the event.

DM5's frustrations were shared in the form of the metaphor, which could be seen as an interpreting phase. However, the metaphor was not understood by the participants. DM5's parallel construction was seen a divergent objective and hidden agenda, which is suggested as barriers to interpreting (Schilling and Kluge, 2009). This could be argued to be experienced in the subconscious rejection by the rest of the participants who seemingly continued the learning process, by simply excluded the input from DM5. Despite DM5's earlier explanation of the shark metaphor and the relation to the environment, we did not realize that the environment was not the business environment but the structures around DM5.

The second example can be suggested related to how the interpretation phase is influenced by how individuals perceive advantage of new systems over existing (Corley and Gioia, 2003), and if knowledge is incompatible with existing mind-set. This perspective could with reference to Schilling and Kluge's (2009) barriers create insights to why DM1 during the follow-up meeting was questioning what was earlier constructed. Crossan et al (1999) suggest that the first steps on the learning trajectory are to create a cognitive map of the "virtual factory". The metaphors, the aspiration model, and the story told on the video can be suggested as being evidence of a cognitive map being created. I experienced how the individual's started to name and explain their experiences and intuitions. I also noted the further development when interacting with others in the social context. The advantages were articulated in terms of the connections, the control tower, and naming the individuals represented on the constructed model. I noted that the specific element of "flowers" in the model was symbolizing the advantages of the new way of working; "showing that LMIOP is a nice place to work". Working with the "virtual factory" had become sense-making and they constructed new meanings for what was previously done (Corley and Gioia, 2003).

The temporary structure created during the search conference (Roos and Victor, 1999; Greenwood and Levin, 2007) seems to be effective as a “sprint”. However, it seems that the sustainability becomes less when the structures no longer exist. The theory can be suggested to support the situation where DM1 seems no longer to agree in the “virtual factory”. The missing link between knowledge and organizational goals (Schilling and Kluge, 2009) could by DM1 be perceived as lack of structure. It shall be recalled that it was DM1 who built the performance management structures and the standards into the aspiration model. The structures experienced during the constructing experiment were not present at the follow-up meeting, which could be suggested to create the ambiguity experienced by DM1 (Berends and Lammers, 2010; Roos and Victor, 1999).

It can be suggested that the learning trajectory had been “invisible” interrupted both in the horizontal flow (towards integrating) and in the vertical flow from individuals to the group level. Berends and Lammers (2010) suggest that such interruptions can be caused by change in organizational structure and procedures, which is the case when introducing the “virtual factory”. It was not clear to the organization that creation of the structures would be part of the learning trajectory.

It can be suggested that the social context itself is not enough to create a phase of assimilation of knowledge. The elements of sharing of meaning, construction of knowledge, and transformation of identity are all necessary for organizational learning to happen. This makes me revert to the three schools of organizational learning (section 2.4) where I suggested organizational learning to take place in the intersection of the cognitive, behaviour, and social schools (Leavitt, 2011; Senge, 1990). The current experiences can be suggested to support that thinking. The parts related to the mental models could be suggested missing or at least we had different mental models in mind.

Insight 7: Working with metaphors and model building can create an abstract context negatively impacting the perception of structure, roles and responsibilities, which can leave the participants with uncertainty and latent lack of common understanding. The structures leading to the creation of the models will not be present when not “playing”.

4.3 What is going on?

The analyses can suggest that the small group of managers has started on a learning trajectory and a change of organizational perception. The empirical evidence can be seen from the development of a common language around the “virtual factory” and organizational learning as a means to improve organizational performance. The group has developed a set of artefacts and metaphors, which is supportive elements in the further development of organizational learning. It is suggested that the artefacts can become the common ground for further learning as they can be assisting the

organization in moving learning from individual intuition to organizational learning (Macpherson and Jones, 2008; Shrivastava, 1983) and further towards institutionalizing (Crossan et al, 1999).

The analyses show indications of internalizing (Akinici and Sadler-Smith, 2018) as I experienced tacit operational behaviours established within the team of managers. The phenomenon can be seen including both the new explorative focus driven from the “virtual factory” concept and the legacy processes as, for example the standardized better practices as in the PSPS system. This can be said to counter-argue my statement from the introduction to the chapter where I suggested avoiding dependency on well-known ways of operating. The analysis shows that the organization might benefit from the legacies as basis for creating new knowledge if balancing of exploitative and explorative activities can be managed. However, it was seen also in the analysis that tacit knowledge also risks suppressing knowledge from outside (Crossan et al, 2011). The tacit culture created within the group also resulted in some downsides, which were seen when more team members were included and as part of the follow-up meeting. In Thorpe and Holt’s (2008) perspective knowledge is linked to the individuals and the lack of common experience can in this way be seen to complicate the integration of the new members. The already created excitement and knowledge around the “virtual factory” was difficult to transfer to the new members.

From the educational journeys it can be suggested that the group was open and interested in new knowledge and developed during the visits an inquiring process. The group of managers were questioning other companies’ ability to learn. This could be suggested to show that the idea behind the “virtual factory” had started to create meaning and that a new way of operating was being accepted. The understanding and interpreting are related to the context of the “virtual factory”. The group has agreed to engage in a collective experience of learning.

Despite the creative approach to build the aspiration for the future LMIOP it was mostly elements from our legacy processes that were included in the model. It can be suggested that the learning was mostly based on common understanding of the institutionalized processes and practices. The organization seems through the construction process to create common meanings from the PSPS concepts, which according to Nonaka, (1991) and Nonaka and Takeuchi (1995) is organizational learning. However, since the event only included a group of senior managers the progress can only count for two levels (individual to group). When applying Crossan et al’s (1999) definitions related to the multi-level learning it becomes clear that despite PSPS has a legacy status the new common meanings created cannot be claimed as more than learning at the group level. From the research cycle it cannot be concluded if the final aspiration model was driven from the knowledge created throughout the event, or if same result would have been obtained from pure collective intuition (Akinici and Sadler-Smith, 2018) making tacit knowledge explicit. This speculation can be supported from Crossan et al’s (1999) acknowledgement of that young organizations have

less established routines and structures and that the dominant learning happens at individual and group level. From my observations I can suggest that the multi-level learning (Crossan et al, 1999) within the two-year-old LMIOP organization is restricted to individual and group learning.

In the perspective of Crossan et al's (1999) 4I learning trajectory it can be suggested that the small group of managers had been moving from individual learning (suggesting and explaining metaphors) to the group level (the aspiration model, changed language, and incorporation of learning from educational visits). Furthermore, it seems that the events have proven to create effective structures enabling organizational learning.

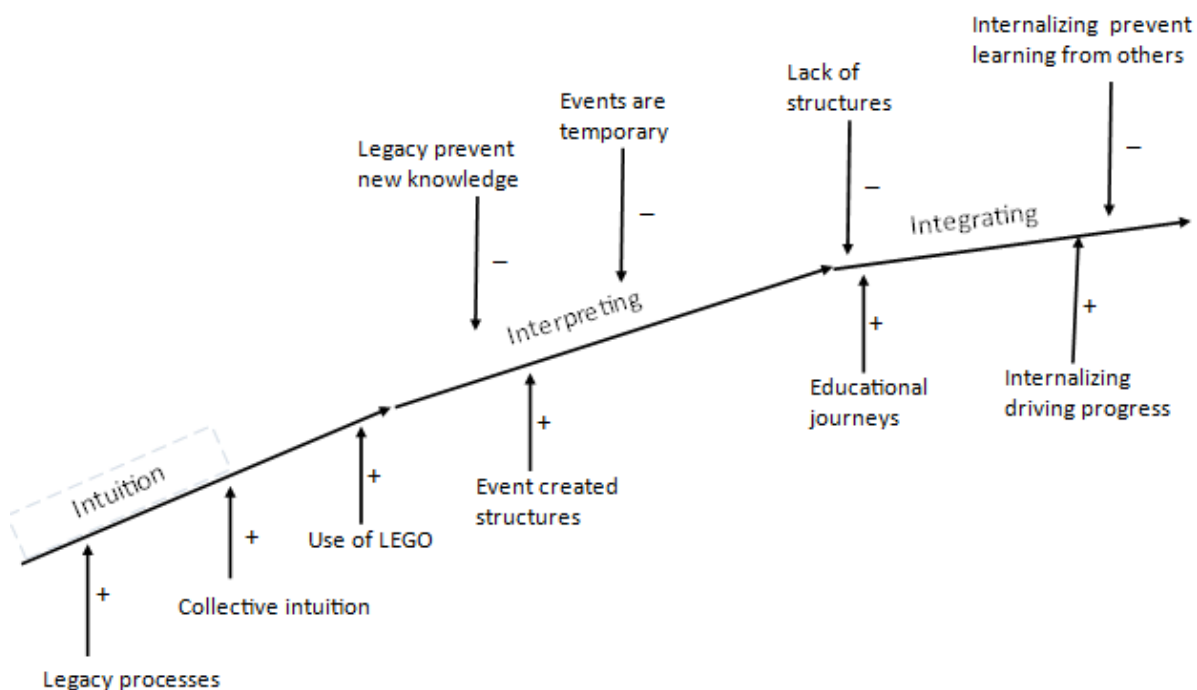


Figure 35 Learning trajectory for the small group of managers

The learning trajectory can be suggested to consist of enablers and disablers (fig. 35), which together have resulted in changes of the groups perception of the organization. The disablers have by Berends and Lammers (2010) been suggested to interrupt or discontinue organizational learning, which in the analyses was seen at several occasions. The group can be argued to be in a change process under the umbrella of the “virtual factory”, but still only consisting of a small group of managers and a fragile process.

4.4 What is next:

This first search conference had shown the power of artefacts and metaphors as enablers of expressing intuition. Furthermore, the principle of “Think with your hands” and the appliance of Lego Serious play as enabler in the temporary structures of events seen as effective to create an explorative

thinking. From the analysis it can be suggested that the use of events not only creates the room of “play” (Roos and Victor, 1999), but also seems to reduce the discontinuation of learning as suggested by Berends and Lammers (2010). The educational journeys can be argued as events boosting the previously obtained learning. In line with the findings, the further roll-out of the “virtual factory” concept could therefore seem to be benefitting from a continuation of these types of event structures. Besides the second search conference I have also planned learning sets as a follow-up session. Furthermore, the already experienced participants from the first search conference can, according to Akinci and Sadler-Smith (2018), be further enablers since the already gained experience can be transferred to new participants. These experienced managers will be acting as facilitators at the next search conference.

The use of Lego Serious Play could be enabler of the creative thinking needed to create new learning. However, it needs to be further investigated if this was conscious process or if the learning process was sub-conscious, which could be suggested from the strong influence of the legacy systems. Further focus must be directed towards the influence of the legacy systems when the learning group is expanded to cover all LMIOP managers. It can still be uncertain if the learning is driven by exploiting existing systems or if the creation of new knowledge becomes integral. However, it must also be clear in my further research that the transformation of tacit to explicit knowledge also, according to Nonaka (1991) and Nonaka and Takeuchi (1995) counts as organizational learning.

To ensure a permanent structure for “play” I have decided that the installation of the interactive monitors must move ahead. The contents for the monitors are still in the development phase; however, the learning that can be obtained from experimenting might create the necessary knowledge.

The insights created during the action cycle results in the following activities:

Insight	Action
1: Intuition is influenced by the institutionalized processes (PSPS and D&S BP 2020) and pre-shaped bricks, whereas interpreting, integrating, are formed within the explorative context (search conference and Lego Serious Play).	Balancing the influence of the legacy processes and the explorative learning must be part of the leadership support during next event. Furthermore, the event structure must become a repeated activity (learning sets and educational journeys) to support internal exploration.
2: The creation of parts and connecting the whole by thinking with the hands might sub-consciously create an understanding of the whole.	It can be expected that the creation of the unit-specific aspirations creates understanding of the mutually supporting systems. I shall in the next research cycle direct focus on the "whole" by using the aspiration model as a pivoting point.
3: The 4I learning process as suggested by Crossan et al (1999) only focuses on knowledge creation. The knowledge is not evaluated to be right or wrong.	In the final discussion it must be included if the 4I learning trajectory can be seen as more than a way of measuring progress and not the direction.
4: Lack of common experience and language can hinder assimilation of otherwise internalized knowledge when the knowledge-holder and knowledge-receiver are physically distant.	Due to the distance of the facilities I will in the future learning events have to include the individuals being responsible and active in the local roll-out.
5: Organizations building on strong legacy processes creates compliance thinking, which negatively impacts feed-forward and double-loop thinking. However, strong legacy processes create the fundamentals for further learning.	The legacy processes can be suggested as the foundation for new learning (exploitative and explorative), which I shall accept. However, I shall ensure an explorative perspective in the integrating in daily practice through balanced scorecard integration.
6: Dominant organizational beliefs carried by influential individuals risk creating a passive assimilation of the knowledge by the rest of the organization or new members.	In the next search conference, I will distribute the Danish management team as facilitators for the new groups of managers invited for the experiment.
7: Working with metaphors and model building can create an abstract context negatively impacting the perception of structure, roles and responsibilities, which can leave the participants with uncertainty and latent lack of common understanding. The structures leading to the creation of the models will not be present when not "playing".	The lack of structures around the "virtual factory" seems to weaken the construct. The tangible evidence of the "virtual factory" needs strengthening. Structures like the monitor system, which connects the different units can be one activity.

5.0 “Getting traction”

The second search conference was a two-day event in Paris. Twenty-seven managers representing the management teams at the different units were participating. The purpose was to create the aspiration for their individual units. Furthermore, the objective was to gain traction on the “virtual factory” concept by replicating the learning experience obtained at the first search conference. I have, based on the positive results, decided to increase the number of events by including the learning sets to maintain focus on learning. This second action research cycle shall show if the increased number of events can prevent the discontinuation of learning as suggested by Berends and Lammers (2010). This second action research cycle will also integrate the findings related to understanding of the whole (I will bring the aspiration model to the search conference) including the integration of the legacy systems (the full picture of performance management must be drawn up), which should create an understanding of the need for applied ambidexterity. During the first action research cycle I also realized the power of influential people and peer pressure, including my own presence as leader of the organization. In this second action research cycle I will reduce the impact by using the already trained managers as facilitators. This could result in a purer learning process.



Figure 36 The model of the LMIO P aspiration as the anchor point

During the introduction I explained how each manufacturing unit and project was contributing to the aspiration of the “virtual factory” (fig. 36). Furthermore, I explained the opportunities for knowledge creation and

sharing, as part of the structure. The learning element was important since it was the first time that the concept was introduced to the full team of managers. As part of the introduction I also created a drawing showing my perspectives of the “virtual factory” as part of the performance management (fig. 37).

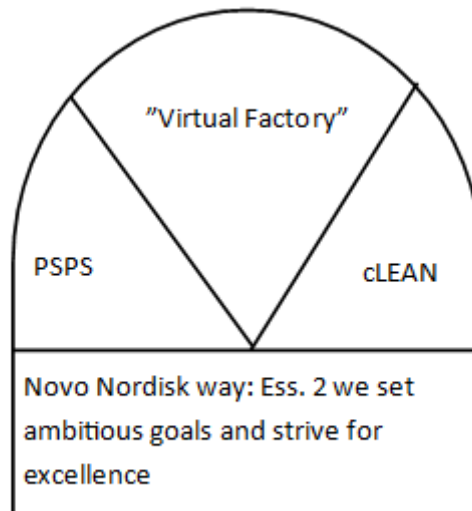


Figure 37 The full performance management system

The figure shows how I see the co-existence of the “virtual factory” with the legacy systems. In this way it could also be understood that all activities (exploitative and explorative) were contributing to organizational intelligence.

As part of the introduction the research program was explained, including the Participant Information Sheet. There were no concerns raised regarding participation. Questions were asked related to my expectations and especially related to when an impact could be expected.

Lego Serious Play was applied based on experiences from the first search conference. Half of the participants were unfamiliar with Lego and the use of metaphors. As seen in the case of AM3, during the first search conference, the warm-up was important to ensure familiarisation with the concept. Furthermore, as seen in the case of AM3 we captured the contribution from all. The remaining experienced participants were a risk of becoming dominant during the event. This phenomenon was experienced during the first action research cycle. However, in line with Akinci and Sadler-Smith’s (2018) internalizing perspective, the individuals with prior experience should accelerate learning by acting as facilitators.

5.1 What is in the data?

The following section contains the data from 1) observations during the search conference and 2) observations related to behaviour and activities after the search conference. The latter relate to the pledges, the balanced score cards, the facilitation report, and reactions to the monitors.

5.1.1 The second search conference.

The search conference was an introduction to learning together and what connectivity means in a social context.



Figure 38 Warm-up rounds showing appliance of connectors

Already from the warm-up (fig. 38) I experienced the sharing of ideas and knowledge. The models were showing metaphors for sharing and receiving information. Interpreting was happening while everyone explained their model to the plenum. However, the assimilation of the thinking and the models did not disclose if the “virtual factory” was accepted or not. Crossan et al (1999) suggest that making something explicit does not necessarily mean a shared understanding. This phenomenon was also experienced during the first research cycle where DM1 felt uncertain about the concept. Crossan et al (1999) suggest that shared understanding must result in coherent action. During the first research cycle DM1 was not coherent with the rest of the group when the concept was challenged. However, this specific perspective indicates a difference between Crossan et al’s (1999) understanding of institutionalizing and Akinçi and Sadler-Smith’s (2018) more pragmatic internalizing. The latter could be the experience from the first search conference (experimenting and new vocabulary).

The individual models were not creating new knowledge but mainly mimicking the introduction to the concept. In line with the 4I learning trajectory (Crossan et al, 1999) I can suggest that the individual intuition phase is influenced by the introduction to the existing model rather than pre-knowledge. I experienced the same phenomenon during the first search conference where it was suggested that the influence came from the common practice and legacy processes. The same collective intuition could be present

at the current search conference; however, due to the larger cohort and participants from five different parts of the organization it can be suggested to be less dominant. The initial introduction could be suggested to influence the intuition. The mimicking cannot be seen as making tacit knowledge explicit but assimilation of known knowledge.

The creation of the individual models had focus on the perceived needs to become successful in the implementation of the “virtual factory”. Each table were hereafter asked to create the connections fulfilling their needs as expressed in the individual models (fig. 39). I noted the individuals’ interest in seeking solutions to needs, and the first example of common experience of that sharing ideas and knowledge increases the organizational intelligence. The connected models were several times referred to as “like a brain structure” due to the connectors across the tables. The statements could suggest a sub-conscious thinking of the learning element.

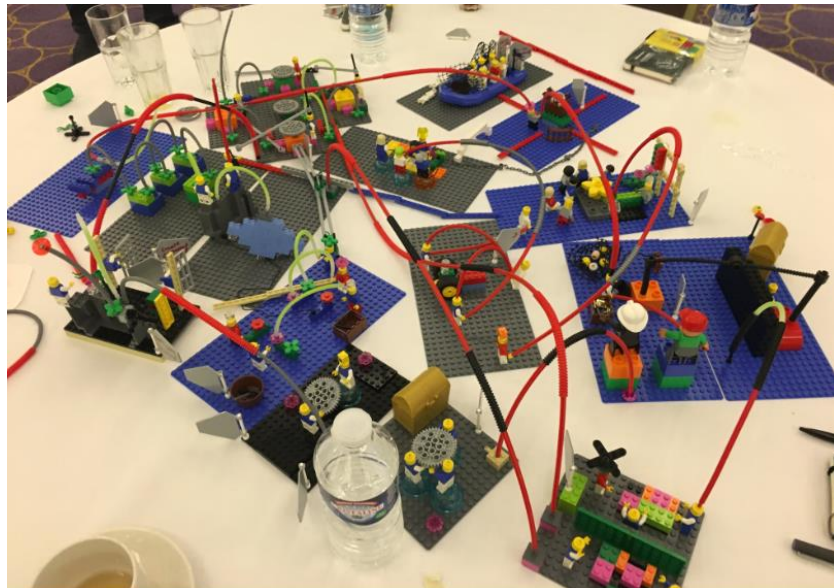


Figure 39 Individual models are connected in a group set-up

The development could indicate an emerging thinking in metaphors beyond the copying of the elements in the original aspiration model. The form of the constructions and the reference to the brain could be argued to relate to sub-conscious (Crossan et al, 1999) recognition of my introduction. Or, in line with Crossan et al’s (1999) argumentation the use of the metaphors could be the link to a shared interpretation, and the dialogue being the creation of a trustful environment for learning to occur (Easterby-Smith, 1997; Handy, 1995). The experimenting shows the impact of leadership support (Senge, 1990) in driving the learning process and balancing the tension between exploiting and exploration. The activities were following the facilitator’s directives. The leadership was in the literature review found related to the social context as described by Senge (1990) and was during the event suggested counterweighing the influence from the exploitative legacy processes. The observation shows me the importance of my

managerial support in the further change process to balance the tension between exploitative and explorative processes.

I was expecting to see increased interaction and sharing of knowledge when new groups were created with the purpose to construct models for future operation. The sharing of knowledge created at the different tables was evident as new metaphors were created. I noted one group creating the “tiger or kitten” metaphor to symbolize the tendency to magnify issues to become problems (fig. 40).



Figure 40 The “tiger or kitten” metaphor

The idea was based DM4’s recognition of the tendency to spend large amount of resources on smaller issues. The inspiration to the metaphor can be suggested to come from the Lego bricks (a tiger and a kitten exist as separate bricks), which was a phenomenon experienced during the first search conference (Lego puts an image to the intuition). The discussion within the group created the shared understanding, which I experienced was assimilated by other groups via plenum explanations and changed group compositions. The pattern resonates with Crossan and Berdrow’s (2003) explanation of the 4I linear learning principle where the starting-point is the individual’s intuition resulting in an image facilitating the interpreting and the shared understanding. Crossan and Berdrow (2003) suggest that the preconscious recognition of a pattern from experiences drives the intuition of the individual, which affects others in the social context.

The Lego bricks can be argued to stimulate intuition and linking DM4’s experience of magnifying problems into the metaphor. The creation and assimilation of the “tiger or kitten” metaphor resonates with Leavitt’s (2011) suggestions of creating experience through experiments and assimilating knowledge from others. The latter is found in line with the early observations where I noted that assimilation resulted in copying existing shapes. The created internalizing (Akinci and Sadler-Smith, 2018) was later seen as the “tiger or kitten” metaphor was introduced in most models. It leads me to consider this as embedded memory within a temporal organizational

structure. DM4's non-articulated experiences had now through the applied metaphor become a generally accepted organizational issue. The metaphor is today part of the organizational vocabulary, which is suggested to show evidence of internalizing (Akinci and Sadler-Smith, 2018).

I experienced, during the search conference, how fast and how easy a good idea spread and how the interactions between individual agents are further developing the ideas. For example, the fencing of the tiger (fig.41) can be argued being a cognitive response to the "tiger or kitten" version. The "fenced tiger" is the mental model of how to avoid making issues into problems and that handling a "kitten" requires less effort than a "tiger". The preconscious recognition of a pattern experienced by DM4 was interpreted and integrated in the group through the interaction between the individuals. I can suggest that shared understanding had resulted in coherent action (Crossan et al, 1999). However, the idea and commitment need to become part of practice before organizational learning can be suggested to be internalized.

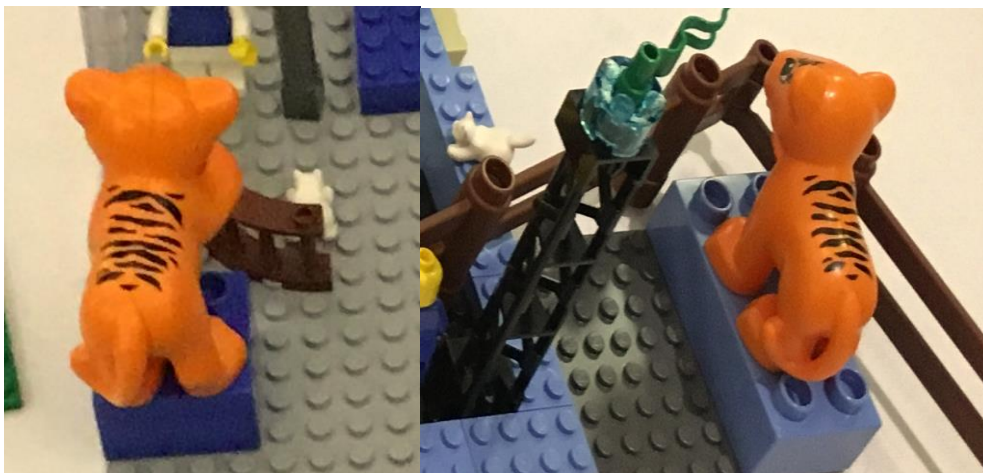


Figure 41 Two examples of the "tiger or kitten" metaphor

The net over the shark (fig. 43) representing containment of problems is suggested as a further development of the tiger or kitten metaphor into another context. The metaphors are isolated elements in the overall picture of what a manufacturing unit is aspiring for (fig. 43) and tells a story about things we now know that we can avoid. However, I also see the development of the metaphors as indication of organizational learning. The metaphors have moved from DM4's intuition into two tracks of learning at the group level: Focus on avoiding deploying excess of resources (the tiger); and focus on containing problems (the shark under the net). Both tracks can be suggested to show an agreed desire to change and increase the performance.

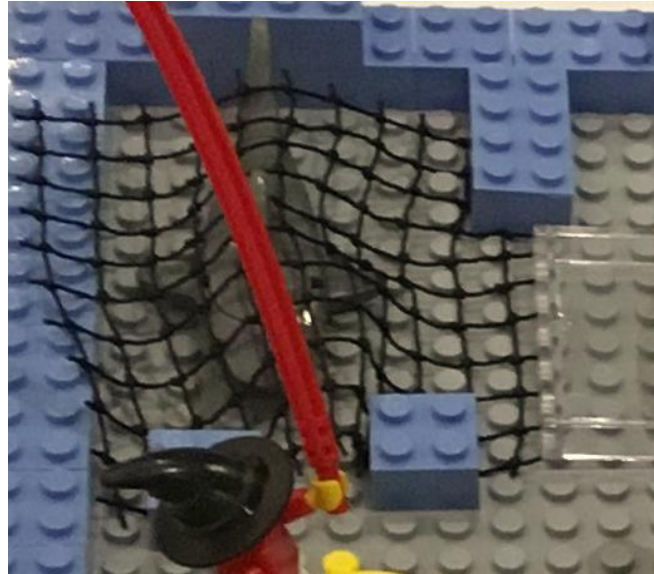


Figure 42 Containing problems (shark is under a net)

The expansion of the metaphors builds upon the individuals' knowledge and from the social interaction during the search conference. However, I found the linking to the "whole" in the LMIOP perspective was somewhat unclear. Handy (1995) argues that for the whole to work, the goals must be aligned between the smaller units and the original aspiration. The constructions and the lacking connections to the LMIOP aspiration could indicate a decoupling from the "whole". The creativity in the constructions had a local focus and created separate aspirations where it was difficult for me to identify the "virtual factory". The same issue was discussed in the analysis of the first search conference, where I suggested that understanding of the separate element were bigger than conscious understanding of the "whole". It can be argued that all the right things are happening for organizational learning to happen. However, it is unclear for me if the overall aspiration got lost in the construction of local versions.

I found that the work at the different tables show a social interaction between the participants and the evidence of personal experiences turning into shared understanding represented in the metaphors. The observations suggest that learning was happening, but in a temporal social structuring as suggested by Berends and Lammers (2010); Roos and Victor (1999). This strength of the event structure was also discussed during the first research cycle.



Figure 43 Final aspiration for the Russian organization

Based on the tangible outcome of the search conference I can argue that this particular setting has resulted in sharing and creation of knowledge at group level (Crossan et al, 1999) represented in the common experience in the social context (Macpherson and Jones, 2008; Bapuji and Crossan, 2004; Easterby-Smith, 1997). However, I will need to see how the event-structure driven learning will materialize in coherent activities (Crossan et al, 1999) in practice.

5.1.2 Observations after the search conference

At the end of the search conference all teams were requested to prepare a pledge on what they would do different based on the two days experience focusing on organizational learning. Furthermore, all teams should consider how the learning could be reflected in the local 2018 Balanced Scorecard. This could be suggested to be managerial support (Senge, 1990) to explorative activity since monetary reward would become a driver and the objectives would be followed by LMIO management throughout the year. All the final models were showing a trophy as metaphor for inclusion of reward, which could indicate a strong interest in the recognition and a bonus-driven culture (fig. 44).



Figure 44 Trophies included as metaphor for recognition

My reflections at the time were that the pledges and balanced scorecards could maintain the structures from the event in ensuring that the management team had a social context to discuss the “virtual factory” and organizational learning. However, all the pledges (fig. 45) were showing a disconnection between my expectations and the thinking within the different management teams.

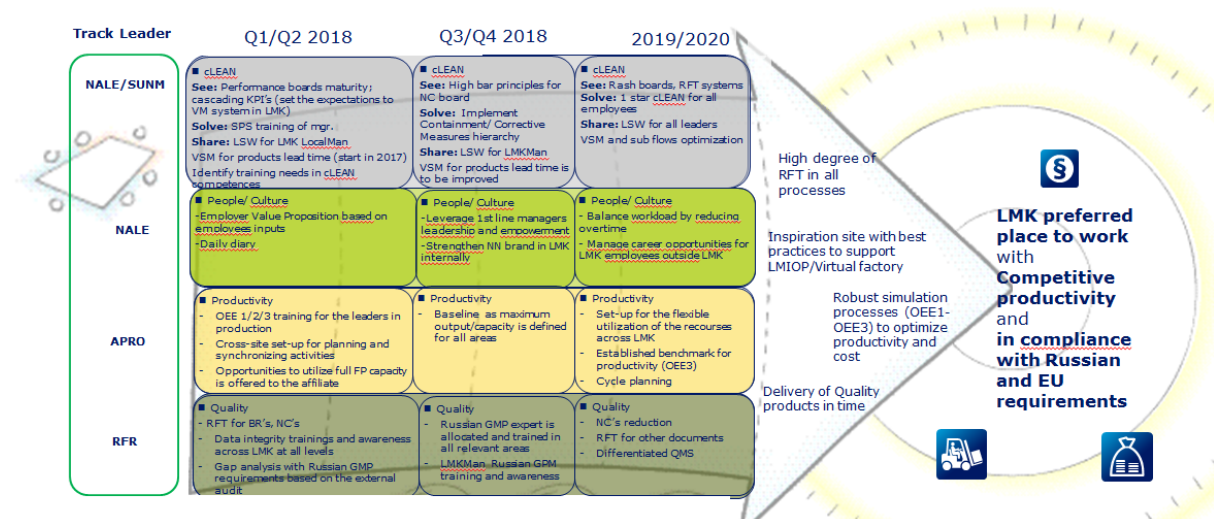


Figure 45 Pledge from Russian unit (see appendix 2).

In the example shown in fig. 45 the pledge takes the form of a long-term aspiration where the reflections from the search conference is reduced to: “Inspiration site with best practices to support LMIOP / virtual factory”. The pledge is focusing on appliance of the traditional Novo Nordisk and Product Supply exploitative performance drivers. Nothing was mentioned on how knowledge can be transferred or assimilated to create more organizational intelligence. My attempt to support the continuation of the linear trajectory by introducing simple “events” had failed. Crossans et al’s (1999) suggestion that shared understanding would be seen in coherent actions was in relation to the search conferences completely absent. The legacy systems have overruled the “virtual factory”, which in the balanced learning model (fig. 6) means that the feed-forward signal has been too weak. The shared understanding and coherent actions were related to the legacy system. The experience supports my hypothesis that the organizational learning observed at the search conference was driven by the event structure. This resonates with Berends and Lammers (2010) observations that the learning trajectory

can be messy and contain several parallel learning cycles. This leads me to consider that the current perspective includes both, the events, the legacy systems and the “virtual factory”.

The main element in the PSPS is by the Executive Vice President and head of Product Supply stated as the sharing of “better practices” (fig.46), which resonates with the content of the pledges. My frustration was not directed towards unfairness in the competition with the legacy systems, but rather towards what I perceived as saying something and doing something different. This I perceived as disrupting the linear learning progression that I was expecting based on the observations during the search conference. My experience resonates with Argyris’ (1985) “espoused theory and theory in use”. The theory can be argued to represent the tension between exploitation and exploration as seen in the constructs of organizational ambidexterity (Birkinshaw and Gibson, 2004; Birkinshaw and Gupta, 2013; March, 1991; Crossan et al, 2011). The less conscious behaviour was driven by the legacy processes, which was well known and had previously resulted in monetary rewards. In hindsight, it can be questioned if my expectations had been realistic? The experiences from the first research cycle indicated that maintaining the learning trajectory was difficult and required focus on event structures. Both Greenwood and Levin (2007) and Berends and Lammers (2010) suggest that the sustainability of learning in the temporarily context can be difficult and can become discontinued. However, at the time my reflections were to balance the tension between the exploitative legacy processes and explorative learning by showing management support (Senge, 1990) in asking for the pledges and integration in the balanced scorecards.

LEADERSHIP BASED ON BEST PRACTICES

It is two and a half years since the launch of PS Production Systems (PSPS), which is manufacturing leadership based on the best practices in the world.

Since we launched PSPS, performance has improved and new best practices have been identified in Product Supply. Therefore we are now updating PSPS with new best practices from different PS units. These selected units have all proven a very high performance based on the described practices.

In Product Supply we are committed to the Novo Nordisk Way by striving to be the best manufacturing unit in the world. This requires continuous improvements in all units – on safety, quality, delivery and productivity.

We accelerate fulfilling our PS mission by being inspired and copying or improving best practices. To be the best, we must continue improving the way we work and strive for excellence.

As a leader in a PS best performing unit, you strive for further improvements.

As a leader in a PS unit, you learn from best practices to improve performance.

As a leader in a PS supporting unit, you identify how support can be as simple and agile as possible in supporting our mission.

*Thanks to all contributors. Impressive performance.
Welcome to PS Production Systems, Edition 2.*

Kind regards,

Henrik

Figure 46 The Executive Vice President's expectation to the PSPS system

This second research cycle provided further insights through statements from CP1 and CP2 who were placed in central positions. CP1 was suggesting that lacking communication was leading to ambiguity. CP2 was reporting back from a visit to the Russian organization that the LMIOP organizational set-up seemed unclear to the local employees. CP2 experienced the organization more attached to other parts of the Novo Nordisk organization (Diabetes Finished Products) than the LMIOP organization. CP2's observation seems to resonate with the Russian management's strong focus on the legacy processes. The observation also resonates with Crossan and Berdrow's (2003) who suggest that infusion of managers from outside can change organizational perception. Half of the Russian management team had recently been transferred from the DFP organization. However, the feedback from CP2 also included a statement that the local Lego model was unknown. The information resonates with my own observations of discomfort in the Russian team when discovering Lego as part of the search conference and as communication tool.

The independent statements from CP1 and CP2 was further supported by the internal facilitation report where it is stated that employees across LMIOP are expressing concerns regarding the lack of actual application of the Lego model to their own units and consequently we are facing ambiguity regarding the strategic direction and priorities (fig. 47).

Finding no. N1		
Severity	Reference	
Minor	Essential 2	
Short description of finding		
Need to improve the understanding and practical application of the business plan		
Description of finding		
<p>Many interviewees acknowledged the creativity of the Lego® model and see it as an effective communication tool of the business model/vision within a complex business setup. Some interviewees expressed concern over the lack of actual application of the Lego® business model to their respective departments. The result is a lack of understanding of the strategic direction of the unit which to some extent creates uncertainty about key priorities and resource allocation. The effect is frustration over what are the key challenges, key priorities and associated goals. There is therefore a need for more thorough communication of the strategy, key challenges, priorities and linked medium/longer term goals.</p>		
Action	Responsible	Deadline
LMIOP Management to ensure an effective communication and implementation of the business plan	laar	01-Apr-2018
Suggestion no. 2		
Reference		
Essential 9		
Short description of suggestion		
Opportunity to enhance and anchor decision making		
Description of suggestion		
<p>Decision making is not always formalised leading to some interviewees' confusion regarding directions and mandate. This can lead to inefficiencies and lack of progress. For example:</p> <ul style="list-style-type: none"> operationalisation of the strategic plan anchoring of the differentiated QMS at the appropriate level complexity of the organisation and who is accountable <p>There is an opportunity for LMIOP to anchor accountability by ensuring decisions are clearly defined and followed.</p>		

Figure 47 Clippings from the facilitation report

The insights related to lacking broad understanding of the “virtual factory” was further strengthened from a dialogue with individuals from the Algerian and Russian organizations in a context where the prototypes of the virtual factory monitors (fig. 48) and the virtual reality systems were presented.

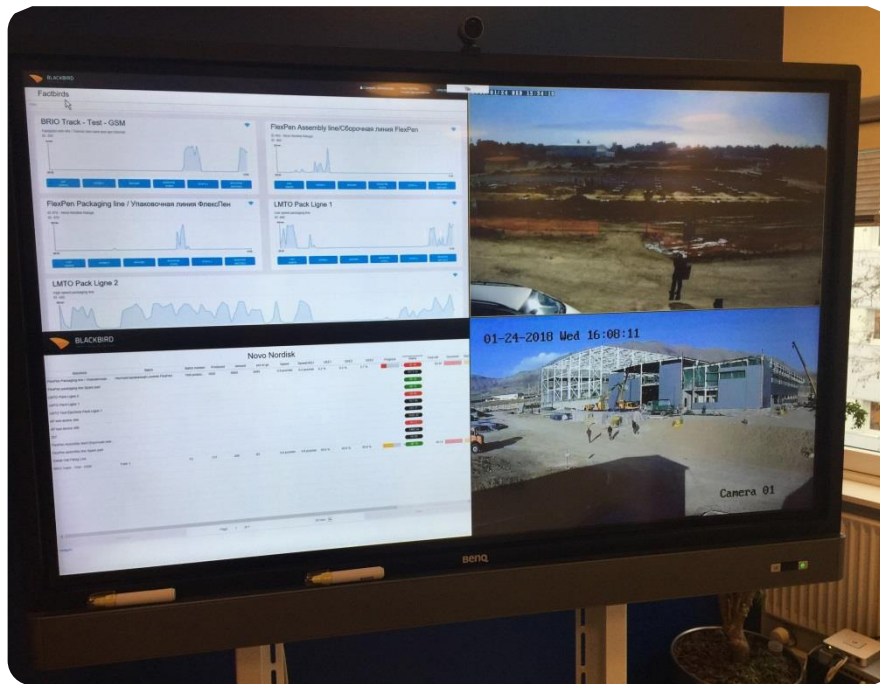


Figure 48 The monitor is showing all elements of the “virtual factory”.

From watching the “virtual factory” monitors and testing the virtual reality by “walking inside” our Lego model one of the Russian employees said: “Now I understand what the “virtual factory” means”. And the employee immediately continued an elaboration on what she had seen by stating: “Could we imagine having our factory in this virtual reality, then we could walk inside and test out new installations of equipment”. I noted elaboration on ideas as example of the purpose of the “virtual factory”. The physical test of the system created an experience for the individual, which could be difficult to create in any other form of communication. The Russian employee can be seen to reinforce that the tension between exploitative and explorative thinking is unbalanced due to lacking tangible evidence of the “virtual factory”. In the simple testing of the equipment I also experienced a catalyst of internal exploration. The Russian employee was showing interest in going further in the exploration. The interactive monitors were not yet installed at the different units, but the insights gained through this second research cycle indicates that common experience is needed to support the further roll-out of the “virtual factory”.

5.2 Presentation of data

The analysis draws on observations from the second search conference, the pledges / balanced scorecards, and the facilitation report. The data is categorized in concepts like the first research cycle and following the process as outlined in appendix 1 (from journal entries, research cycle, concept development and categorization).

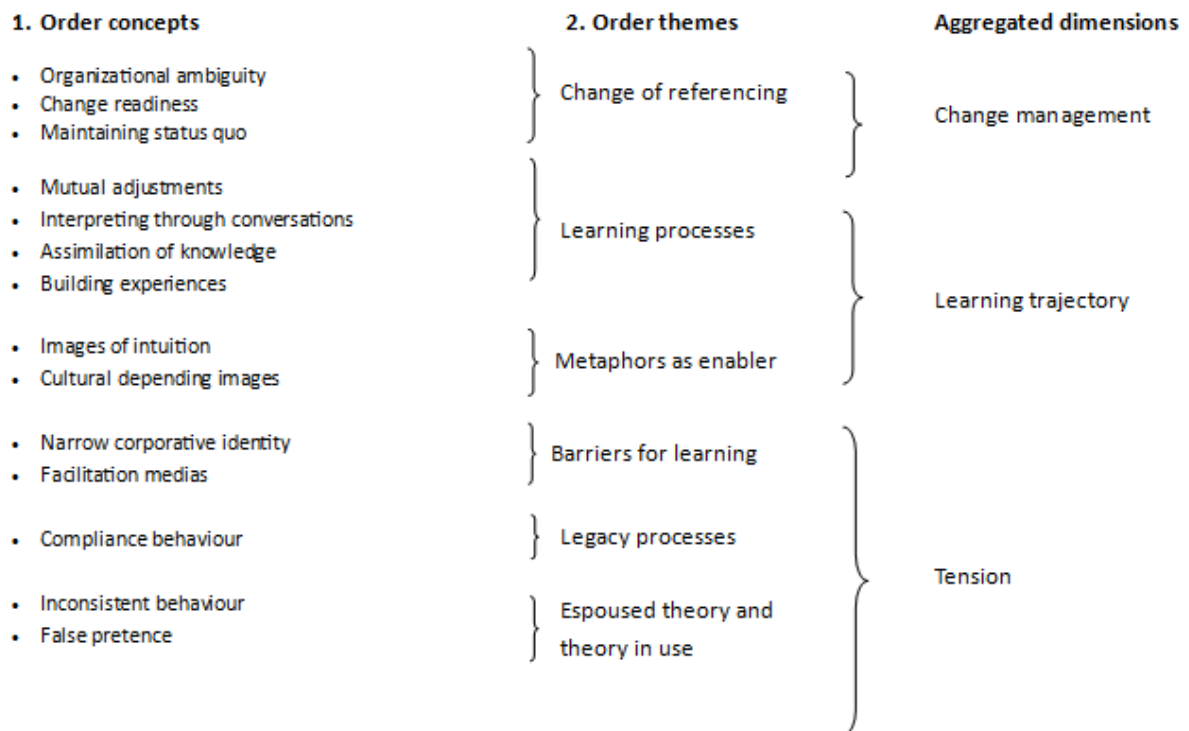


Figure 49 Codification related to second search conference

The aggregated dimensions are the pivoting elements in the following three analyses sections: 1) Change management, 2) Learning trajectory, 3) Tension.

5.2.1 Change management

Change of referencing with an underlying theme of identity ambiguity shows that my reinforced message during the introduction to the second search conference did not create the clarity expected. I experienced indications related to unclear belonging, reinforcing existing turfs, and the difficulties of letting go of what was familiar. This suggests that other issues than understanding the organizational structure is the reason behind the identity ambiguity. It further resonates with the statements from CP1 and CP2.

“Lack of communication about LMIOP as one organization”

“The Russian unit seemed more attached to the Diabetes Finished Products (DFP) organization than to LMIOP”.

The two independent observations can be suggested explained from Corley and Gioia’s (2003) argument that new meanings must be created for what we did before. As mentioned, most of the senior staff has a recent background in Diabetes Finished Products (DFP) and the meaningfulness from this organization is taken into the LMIOP organization where less strong

organizational structures and culture exist. Crossan and Berdrow (2003) observed in their studies of the Canadian Post Corporation similar behaviour. The introduction of managers from outside the organization who were carriers of new knowledge created a change of organizational cognition. The Canadian Post Corporation adopted behaviours from the automotive industry and it can be suggested that the Novo Nordisk Russian manufacturing organization adapted DFP behaviours. The source of intuitive insights can as such be suggested to be the legacy processes via the new managers. I suggest that this phenomenon was experienced during the first research cycle where RM1 signalled strong dependency on PSPS. The hands-on expertise and experience can be suggested to influence interpreting and integrating by authority and collective intuition since the managers felt comfortable within the structures of PSPS. I can suggest the collective intuition related to a local context, the Russian unit, but based on the global legacy system. What is identified as identity ambiguity could also be an example where I have been unsuccessful in balancing the tension between the exploitative PSPS activities and the explorative learning. My reflections at the time might be biased from my own past in the DFP organization (two years ago) and my relatively new thinking on organizational learning as leverage for organizational performance.

The facilitation report creates further support to the need for structures.

“Some interviewees expressed concern over the lack of actual application of the Lego business model to their respective departments”

“...which to some extent creates uncertainty about key priorities and resource allocation”

“There is therefore a need for more thorough communication of the strategy, key challenges, priorities and linked medium/longer term goals”.

The statements indicate that the Lego aspiration was known to exist but that the roll-out has been unsuccessful and that the presence of the aspiration had created confusion on priorities and identity. The lacking roll-out could be suggested to be caused by the managers need for identity and structures. No formal roll-out process for the “virtual factory” had been launched since I expected the search conference to become the catalyst creating the desire to change. In the absence of a strong feed-forward structure I can suggest that the legacy systems had created an internalizing culture, which is seen from the adhering to the values known from PSPS and the imported DFP behaviours. The new concept did not create sense since guidance was from the focus on the balanced scorecards, which could be reinforcing the belonging in the DFP world (similar key performance indicators).

In contrast to the first research cycle I can now compare the different units. This creates better granularity to the analysis. The Algerian managers have no experience in the PSPS and show less internalizing since no structures

from the manufacturing networks were applied. Hence, letting go of a sense-making structure was more difficult for the Russian managers since it was their identity and anchor point in their daily practice. During the search conference I observed the phenomenon as some participants were reaching out and embracing the change whereas others were collecting “tools” to strengthen their turf. I noticed how this especially was the case among the Russian participants and the business support participants from Algeria. AM4 stated: “It would be better if we were in a group with other business support managers” I noted from the statement that AM4 was feeling uncomfortable working outside the area of expertise and did not see relevance in working for the “whole”. I experienced how AM4’s contributions were focused on the elements within the business support disciplines. AM4’s perspectives were echoed and supported from the Russian business support manager (RM2). I observed the same phenomenon in the pledges and Balanced Scorecards where the “virtual factory” was disregarded and all focus was on the legacy systems. Further evidence can be suggested in the creation of the local Lego aspirations where the Russian version contained a wall around the activities (fig. 43), which could suggest a protection of their own identity.

Maintaining status quo resonates with Corley and Gioia’s (2003) suggestion that changes, and learning require that new meanings are constructed for what we did before. For example, during the constructions I noted how the models built during the warm-up became so meaningful to individuals that it became hard to dismantle and build new versions. In our practice we cannot “dismantle” what we have constructed in terms of organizational set-up and ways of operating. For example, we can complain about time consuming processes we tend to hold-on even that we can abandon. This leads me to consider that our habits are creating a context where we deploy resources to unnecessary processes. The “virtual factory” is newly presented and still based on experimental grounds, which means that the legacy processes are more meaningful, and to a degree where walls to protect are constructed (fig. 43).

Corley and Gioia (2003) also suggest that organizational learning and organizational identity as interrelated and one being enabler for the other. It is argued that learning can change how we perceive our organization and lead to redefinition. Corley and Gioia’s (2003) suggestion resonate with Crossan et al’s (1999) learning trajectory where the interpreting takes place in relation to an environment of operation. The “laboratory” experience can be suggested to be happening during the search conference as the first models were changed as participants got familiar with metaphors. It was no longer needed to hang-on to the first intuition since experience created the knowledge and understanding of a new context. I see this perspective supported from the observation of the Russian employee who understood the “virtual factory” after experiencing the monitors and the virtual reality. The situation suggests that common experience can change organizational identity. The internal explorative desire would facilitate the uptake of experiences from outside Novo Nordisk.

Casey's (2005) suggests, that the environmental uncertainty, hereunder the belonging, is one of the important factors influencing the learning. These are institutionalized structural and procedural arrangements. Casey's (2005) perspective and Corley and Gioia's (2003) suggestion that learning, and identity are interrelated seems to create a dilemma. Structures are enabling organizational learning (Casey, 2005) and learning creates meaning to organizational structures (Corley and Gioia, 2003). The dilemma can be suggested to explain why the created structures and procedures were only valid for the event where both structures and learning was timewise condensed to counterbalance the legacy systems. A temporarily strong belonging could be suggested to be created. In the daily practice the condensed situation cannot be maintained and the safety within the known structures becomes prevailing and causes discontinuation of the learning trajectory.

Insight 1: Manufacturing managers can be suggested to have needs for clear structures to support their daily management routines. However, these structures can hinder new explorative learning.

Insight 2: Transferring individuals from one organization to others will create new knowledge and from the cultural influence also change the collective cognition of the organization.

5.2.2 Learning trajectory

Learning processes were during the search conference observed taking place at more levels (Crossan et al, 1999; Easterby-Smith, 1997; Macpherson and Jones, 2008). However, in the context of the search conference with limited time and temporary structures the levels considered was restricted to individual and group level. The data from the categorization (fig. 49) reflects how easily twenty-seven managers assimilate the knowledge "in the room" and how fast metaphors and structures travelled between the different Lego models. I noted the creation of four clear metaphors, which were all present in the final models.

The tiger and kitten. The fenced tiger. The trapped shark. The trophy.

Crossan et al (1999) suggests this as the movement from individual to group level through new insights created from the conversations and the impact of changing groups. The infusion of knowledge and ideas from new group members can be suggested to be like the experiences built by Crossan and Berdrow (2003) when introducing individuals from the automotive industry into the Canadian Post Corporation. I can suggest the same mechanism to be the driver of the learning process during the reflection sessions and the

warm-up rounds. The input from the facilitator and me as leader of the organization challenged the perception of the organization. The infusion of new knowledge or perspectives created the change from seeing the environment full of obstacles to a context where the participants could make a change from “doing”. I suggest that the barriers were anticipated and built on the current situation since the “virtual factory” concept had just been presented. We project obstacles from what we know today into a future operation, which could prevent us from embarking on the journey.

Morgan (2006) suggests that seeing everything from a fixed standpoint and consequently hitting barriers can be attributed to managers with less experience where actions and behaviours often becomes rigid. Managers with less experience could be suggested to find comfort in the PSPS structures, which makes the management activity predictable. The perspective resonates with Mezirow (1997), Hill (2000) and Holmes (2008) suggestion that manufacturing managers’ focus on exploitation and short-term objectives. This can be suggested to be experienced during the first part of the sessions where all participants saw barriers but no solutions where they could contribute. The manufacturing managers were facing an unknown challenge and created a “tiger” by anticipating reasons for failing. The reflection sessions created a change to the group level, which was important for the next day’s learning opportunity. The group started to see itself in control of the environment. The learning process can be suggested to have moved from an individual image of the organization full of barriers (shown in the first models) towards the collective understanding of being in control and understanding the whole. This change to a group level is decisive for further learning, which especially was seen in the development of new metaphors. At the time I saw this change in attitude as a breakthrough and was reflecting on how this change could be maintained in daily practice. I also reflected on if the change was related to the close interaction between less experienced and very experienced managers. It leads me to consider that Akinci and Sadler-Smith’s (2018) collective cognition could allow for the experienced managers to impact the perception of the context.

The full aspiration consisting of more metaphors can be suggested to represent multiple learning processes. These together form the learning trajectory. The process shows a conscious phase where individual and shared understanding is created through social activity to become knowledge at the group level (Crossan et al, 1999). However, with the original model in the room it can also be suggested that the experience was learning through observations and imitations (Leavitt, 2011). The phenomenon was during the literature review discussed in the context of routine and repetition (Nelson and Winter, 1982) with the focus on adapting and refining of what was already known. The behaviour can be suggested to reflect daily practice when applying the legacy systems in driving incremental improvements based on better practices. The “tiger and kitten” metaphor was suggested by an experienced manager and in the social context incrementally improved to the “fenced tiger”. I can also suggest this behaviour in line with Morgan’s

(2006) suggestion that less experienced managers' rigidity and dependency on copying what I had already approved.

It can be suggested that the improvements responded to the changes in the environment or refining what was seen on the model in the room. Each new construction session created a sharing and refinement of previous metaphors (for example, the connector pipes becoming bridges and ladders to overcome barriers) as well as creating new or improved versions (the tiger and the shark). The spiralling effect is by Doyle (1997) suggested to happen naturally in organizational structure as organizational learning by assimilation (Nevis et al, 1995), which can be seen in line with the institutionalization of PSPS. The learning at the conference can be suggested to consist of assimilation of better practices (creating common experience) and incremental improvements. The process also shows the dynamics between the individual and group level which can be suggested as new knowledge to the group. The group level tends to spark new individual intuition experienced in the improvements or new metaphors.

Insight 3: The learning trajectory seems to be a spiralling phenomenon driven and accelerated from the learning processes happening in the social context where individual intuition is shared, understood and refined at a group level.

Insight 4: Introducing knowledge from outsiders can change the organizations self-perception and perception of the environment.

Metaphors as enablers of organizational learning can be suggested to be experienced throughout the search conference. The individual intuition based on thinking about the LMIOF operation and the "virtual factory" resulted in development of an aspiration model explained in three dimensions. The aspiration can be suggested to consists of several separate metaphors that earlier was argued to represent each a learning cycle.

<p>The shark representing the ambiguity in the business environment. The flowers representing the good organizational climate. The tiger and kitten, representing a tendency to magnify problems. The connector pipes and bridges, representing the need for exchange of knowledge</p>
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The metaphors are suggested to represent how individual intuition is expressed by images and where images became shared knowledge from social interaction. Further development was seen in the improved metaphors.

<p>The fenced tiger, representing our ambition to avoid spending unnecessary recourses. The tied down shark, representing the containment of uncertainties.</p>

The metaphors show the development from individual intuition to group level integration where shared understanding is created through the mutual adjustment. The metaphors seem to be facilitating a common language where intuition becomes articulated and interpreted (Crossan et al, 1999) as for example the fenced tiger. Said et al (2001) suggest that the use of Lego has the potential of co-constructing signs and it can be argued that what was first articulated by one person is now in the hands of many individuals. The ideas are collectively proposed or re-proposed as part of assimilation or mutual adjustments. This would suggest integration of the metaphor as knowledge at group level. Said et al (2001) argue that the use of metaphors in any form cannot stand alone since it represents the intuition of an individual or a group. Morgan (2006) suggests that metaphors are incomplete and creates a biased picture.

The strength of using metaphors lies then in the understanding of that insights are one-sided. This can be suggested experienced in the influence from the individuals who were part of creating the original aspiration model. The group had created the shark, the flowers, and connectors, which were elements seen in the later constructions. However, these perspectives were the biased interpretation by a small group of individuals but influencing the larger group of twenty-seven managers from various geographical locations without discussing the possibilities of building on a biased perspective. Said et al (2001) describes the multimodality as a risk for misunderstanding. This means that we cannot rely on that a metaphor will only be related to the shape but will require an understanding of the individual behind the usage of the metaphor. This was experienced when I was using the owl as sign of knowledge on one of the constructions. In Algeria this was a sign of bad news. The same can be said for the use of the tigers, the sharks, and the flowers, which represents the on-sided insights and perceptions of a reality. During the first search conference, the team had misunderstood DM5's shark metaphor. We thought it was the business environment; however, DM5 focused on her own situation. This was later clarified through dialogue between DM5 and me as part of the daily routines in the organization. DM5 explained the frustrations related to being part of an organization outside LMIOP where the operating modus was perceived as controlling and restrictive. The perception of being controlled had been leading to the shark metaphor. However, DM5 expressed that this metaphor would turn into the friendly and helpful dolphins if the reporting lines could be changed as for DM5 to become part of LMIOP. It was the perception that this could create a better understanding of DM5's ways of operating and need for "freedom". It was explained that the pond of sharks would turn into the pond of friendly dolphins meaning that DM5 would feel in a safe environment surrounded by friends. The change never took place and DM5 left the organization.

The assimilation of the metaphors in the later aspirations can be suggested to create evidence of the strength of metaphors stretching our imagination but also shows the danger of imposing a biased aspect of realities (Morgan, 2006). In our case of applying Lego Said et al (2001) suggest that it is not a communication between the brick and individuals but communication

between more individuals, which resonate with the learning in a social context facilitated by a media (Lego). However, the kind of media and the shapes can be suggested to create a bias. The different shapes of the Lego bricks (sharks, tiger, flowers) can be driving the imagination in a pre-defined direction. Furthermore, the pre-defined shapes can also be argued to become an artefact like the standardization or the aspiration model, which unintentionally becomes an image of who we are.

Intuitively it can be suggested that the use of metaphors and artefacts had a positive impact on the organizational learning during the search conference. However, the story must be equally understood within the organization. The single metaphors might be understood as they have been discussed in the management team and described in the created 3D animation of the aspiration. However, the statements and the facilitation report can suggest that the full aspiration stands known but somehow unclear to the organization. Said et al (2001) and Morgan (2006) suggest that this risk can create misunderstandings and ambiguity on identity and priorities.

Insight 5: It can be suggested that the use of metaphors both create a way-point to follow the learning trajectory but at the same time carries the risk of creating a one-sided perspective of the context. The constructed metaphor or artefact can only be suggested to be fully understood by the group creating the model.

5.2.3 Tension

In the beginning of the search conference there was resistance towards the “virtual factory”, which was seen from the models showing blocked situations (fig. 50). As mentioned earlier the event was the first presentation of the “virtual factory” for the full group of managers and therefore the resistance cannot be built on experiencing the concept. But can be seen as intuition built on previous experiences. It can be suggested that the construction of barriers was part of the early stages of Crossan et al’s (1999) learning process (intuiting phase).



Figure 50 Barriers used in expressing unfulfilled needs

The barriers for learning were related to lacking structures or activities where the individual was expecting someone else to take action. I challenged the groups if the barriers were real and documented. My inquiry was based on that the concept was only just presented. The behaviour is by Crossan and Berdrow (2003) suggested as top-down orientation with a possibility of changed interpretation. This leads me to consider that I created a discontinuation of learning (Berends and Lammers, 2010) but I can also be suggested to create a correction of the current beliefs and in this way modifying the intended trajectory (fig. 51). Cook and Yanow (1993) suggest that organizations learn by its members and hereby also ingested new members holding new knowledge, which might alter the beliefs and the intended learning trajectory but also risk to creating tension if new meanings are lacking (Corley and Gioia, 2003).

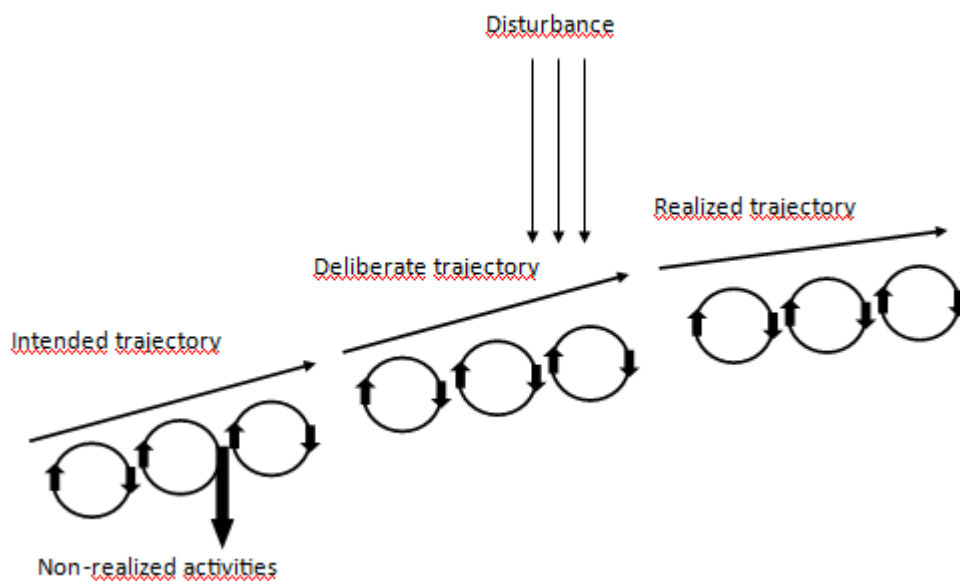


Figure 51 Influence from outside might change the intended learning trajectory

Further tension and barriers for learning was seen in the use of Lego. The appliance was based on a perception built on my own experience working with Lego Serious Play and insights gained from the literature (Said et al, 2001; Roos and Victor, 1999; Frick et al, 2013), which suggested Lego as an enabler of creative thinking. However, the data shows some cultural clashes regarding the use of Lego. Initially I identified the group of Russian managers' clearly feeling uncomfortable in being asked to work with what they only had experienced as children's toy. The observations were after the conference confirmed by the Danish head of the Russian organization who explained how the management team had expressed their concerns about going back to Russia and explain their model to the rest of the organization.

This antipathy against the media can be suggested as a limiting factor in the creativity and learning. Based on this experience I initiated further inquiries to the perception of the use of Lego, both in the Algerian and the Danish organization. The results were to my surprise similar to the experience with the Russian team. The inquiry helped me to understand that the issue was not purely related to cultures since the same "resistance" was expressed

among, Algerian, Russian, and Danish individuals. The potential danger in using Lego is acknowledged by Said et al (2001) in suggesting that sympathy or antipathy for the medium will impact the associations and the intended message might be distorted. This perspective resonates with the general antipathy I experienced within the three different cultures. The media was not seen as appropriate as a communication tool. The response within the Danish organization, but outside the management team, was very surprising since Lego had become an integral part of our office environment (Fig. 52). Thus, it can be suggested that we have built a common intuition within the Danish management team, which includes the presence of Lego in the office environment but excludes members of the organization outside the management team.

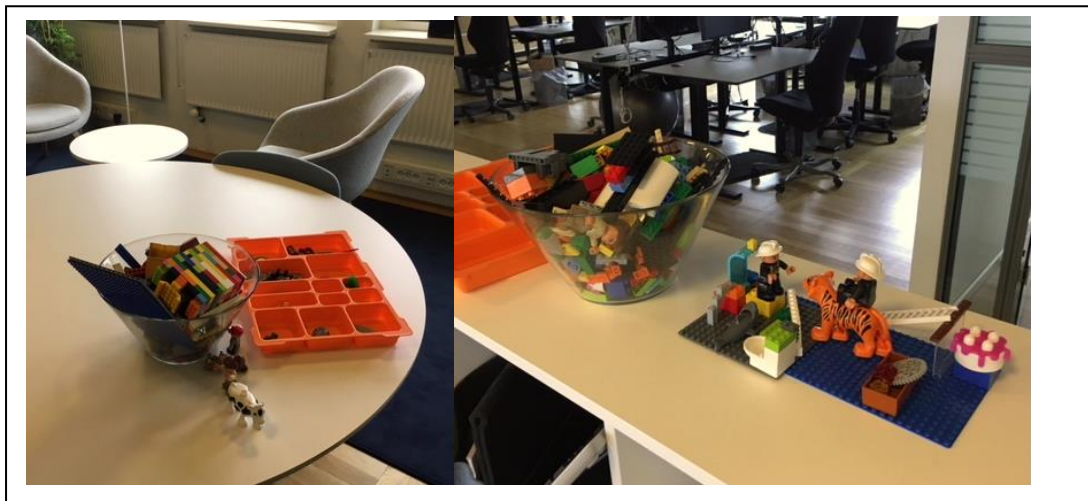


Figure 52 Lego bricks in the office environment

As a remedy I have post-meeting issued articles, Lego speaks (Said et al, 2001), to “justify” the relevance of applying this particular enabler. I will in the later research action “the learning sets”, revert to the impact of the action.

Insight 6: It can be suggested that leadership direction and changing of organizational composition can facilitate to overcome barriers in change situations since new perspectives will challenge dominating perspectives.

Insight 7: The effectiveness of facilitating media like Lego Serious Play is dependent on the antipathy or sympathy created. Shared meanings through story-telling might be lost if antipathy exists.

Legacy processes were already described as strongly influencing the first search conference. In the second search conference it was experienced how participants were searching for elements, which could be related to the existing better practices or represent better practices. For example, the constructions include the performance boards and individual development, which were also seen on the first aspiration model. However, in the second research cycle I also included the pledges and the balanced scorecards, which could provide insights to the impact of the search conference in the

following daily practice. I experienced that the intuitive behaviour was to search for answers in the PSPS. The first reaction at the search conference and the pledges were to check the “knowledge warehouse” for tools matching the problem at hand. This resonates with Simon (1994) who suggests legacy processes are preventing employees from realizing their growth potential. The phenomenon was seen in the compliance behaviour towards the PSPS but also in copying metaphors from the original aspiration model.

I experience that the Novo Nordisk legacy processes like PSPS and LEAN are supportive in creating a common platform for further development as similar to the experience of copying the existing metaphors. The institutionalized systems create a common language and experience through the extensive training programs and the appliance in daily practice, which Easterby-Smith (1997) argue is essential for organizational learning. The dominance of the legacy processes in daily practice can be argued to be a risk in preventing new thinking. This was seen through the search conference where especially the Russian organization was focusing on how to apply our legacy systems within the different construction exercises instead of applying the creativity as the use of Lego should foster.

The management team was, like in the first search conference, applying the day-to-day thinking, which Hill (2000) suggest characterizing manufacturing executives. In Crossan et al’s (1999) terminology they were applying institutionalized processes. However, the event-driven learning process during the search conference provoked a continued progression on a learning trajectory, which could be argued to represent an accelerated development of better practices. This was experienced in the way that the original metaphors were further developed and eventually resulting in the local aspiration models. The behaviour resonates with the idea of incremental improvements, which is embedded in PSPS. It can be argued that the introduction of the “virtual factory” concept creates a tension between the known exploitative processes and the unknown explorative journey of organizational learning. The tension might also be suggested to be the difference between the dynamic capabilities and strategic renewal where the essence is that organizations explore and learn new ways while still exploiting what is already known (Crossan et al, 1999; March 1991).

Insight 8: Strong legacy-based organizations risk focusing more on knowledge management than creations of new knowledge. The organizational members are searching in the “tool-box”, which might prevent realization of full growth potential. However, the legacy processes can become the common experience as a base for new knowledge creation.

Insight 9: The use of events can be seen as a measure to counterweight the strong influence of legacy processes, which in daily practice can become dominant.

Insight 10: The focus on the exploitation of known knowledge and improvements of metaphors seems to direct focus away from explorative learning.

Espoused theory and theory in use (Argyris, 1986) or what I perceived as non-consistent behaviour was related to the follow-up in terms of the pledges and balanced scorecard. The compiled data is in this context the statements and proposed actions outlined in the units pledges and balanced scorecards (appendix 2).

The Algerian manufacturing unit had acknowledged the search conference by starting the pledge (appendix 2):

“Following our leadership summit...”.

In terms of learning the Algerian unit addressed the opportunity of creating a network with the more experienced Russian organization with the purpose of sharing better practices. This can be suggested to reflect the intentions behind the “virtual factory”. However, the mentioned network between the Algerian and Russian manufacturing organizations were not acknowledged in the pledge from the Russian unit and neither was it mentioned in the first version of the 2018 Balanced scorecard. The following statements are found in the pledge (see appendix 2):

“LMK preferred place to work”, “High degree of RFT in all processes”, “Delivery of quality products in time”, “Performance board maturity”, “Leverage 1st line managers and empowerment”.

These data could suggest a Russian unit focusing on being the preferred employer, focusing on performance development based on LEAN, people culture (work-life balance, leadership development, career opportunities), and quality parameters related to regulatory compliance. One explicit reference to the search conference could be found in the below statement from the pledge (appendix 2):

“Inspiration site with best practices to support LMIOF / Virtual factory”.

However, this statement also shows clear link to the PSPS. The data was somehow confusing since I had expected an explicit acknowledgement of the two days focus on improving performance based on the common experience from creating the aspirations. At the time, my reflections were to see references directly related to the local aspiration model. It could have been elements related to how the cost of problem handling could be reduced (the fenced tiger). However, the responses were objectives with focus on performance improvements through the exploitation of known better practices from the PSPS. I perceived the responses as saying something (the theme of the Paris conference) and doing something different (applying the institutionalized processes).

I was frustrated since I did not see the drive towards explorative activities, which would support strategic renewal. Argyris' (1986) thinking on the conflict between what individuals say that they believe and what they do (espoused theory and theory-in-use) could help to explain what I experienced. The theory-in-use was based on what was the intended purpose of the organization (reliable supplier of medical products) and with a focus on maximizing productivity (at the lowest possible cost). This perspective was truly reflecting what the company is asking for and evaluating against. From the pledges and the balanced scorecards, it can be suggested that I experienced a consistently acting inconsistently with my expectations. However, in hindsight I realize that the governing values are set by me and in this way, I have created a feed-back loop to evaluate the behaviour of the teams.

It can be argued that my frustrations were due to being trapped in my own single-loop thinking, focusing on the explorative activities and in this way neglecting the balancing with the exploitative elements from the PSPS. It can be suggested that the organizations behaviour is consistent with the company requirements and that it is my attempt to create learning as part of the "virtual factory" that comes out as inconsistent. What I initially saw as a difference in espoused theory and theory-in-use could as such be suggested to be part of the tension between exploitative and explorative activities within the organization. The manufacturing part was acting towards what could be expected and as suggested in the literature by Hill (2000) and Holmes (2008).

Insight 11: Inconsistency observed was towards the research expectations of creating an explorative perspective. However, the new perspective created a disturbance and connections to other systems were not explained, which created a tension between exploitative and explorative activities.

5.3 What is going on?

Searching, is by Greenwood and Levin (2007); Roos and Victor (1999) said to be a co-generative learning process where people can engage in structured knowledge generation or "play". The search conference for the twenty-seven managers can be suggested to be such a structure where the participants are trying new ways of thinking and acting. Greenwood and Levin (2007) suggest that the search conference is a way to plan elements of the future, which can be said to be the case when working on the aspiration for the "virtual factory". However, it might have been the structure of the conference that turned out to become more important and creating more insights than expected.

Structures, both during the search conference and especially during daily practice seem important for the twenty-seven managers. Casey (2005) suggests that the certainty following familiar structures influences positively organizational learning. In the daily practice this can be said to be found in

the appliance of the legacy systems like the PSPS. Since the PSPS is mostly exploitative tools, it can be argued that most learning happens as assimilation of better practices. However, during the search conference the twenty-seven managers were exposed to new but temporary structures with the purpose to provoke alternative ways of thinking and preferably the experience of how organizational learning can result in renewal to the ways of operating.

The condensed set-up of structures (working in small groups, limited time on tasks, and Lego as enabler) was creating an organizational learning laboratory where the progression along Crossan et al's (1999) learning trajectory can be suggested measured on the development in the creation of metaphors representing experienced problem areas. The individual intuition was in the social context through inquiry passing the interpreting and later refined in the phase of integrating. The context of the group creating common construction also triggered new intuition at the individual level, which often turned out as metaphors representing solutions to problems. However, I also note that most of the development is incremental improvements directed to solve current problems. The phenomenon is very well exemplified in the tiger and kitten metaphor and the later containment.

The experiences from the development of knowledge can be said to support "survival" thinking, which I discussed during the literature review. Macpherson et al (2004) suggested that the cognitive abilities were the key to create innovative responses to changes in the environment and at the same time risk blocking the imagination. The authors suggest that organizational learning is a pattern of collective activities in a systematic pursuit of improvements. Since our organization has no situation of crisis I see the changes proposed in the metaphors as planned adaptations of improvements, which could be noted as an explorative feed-forward model (Macpherson et al, 2004). The mix of exploitative and explorative perspectives, which was discussed during the literature review and now seen in practice, can be argued in line with the thinking of the learning trajectory consisting of many separate learning cycles (Berends and Lammers, 2010; Macpherson et al, 2004; Doyle, 1997).

I can suggest that it is sub-cycles in the learning trajectory leading to the full aspiration model. Crossan et al's 4I learning process will then consist of a spiralling trajectory, where several sub-cycles result in what is seen as the linear process. This perspective resonates with Berends and Lammers (2010) suggestion of discontinued learning, which could be separate enabling learning loops. This suggestion could also explain that the learning trajectory can be seen as continuing despite set-back and discontinued learning.

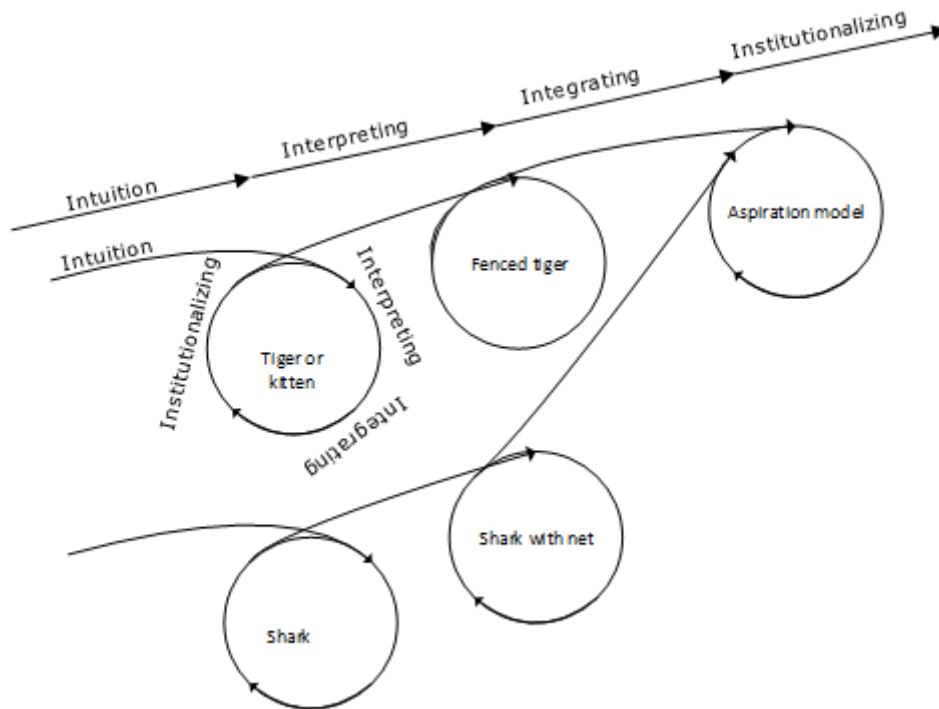


Figure 53 The spiralling learning trajectory

The disturbance to daily activity, which can be suggested to be represented by the search conference, was sufficiently strong in the feed-forward signal to prevent a shift back to exploitative behaviour. However, in daily practice it seems that the structures and familiar standards create a feedback pressure, which can be seen trying to adjust the system back to status-quo. The regulation is not fully successful, which is seen from the experienced identity ambiguity. It can be suggested that the introduction of the “virtual factory” has created a tension, which has disturbed the general perceived picture of the organization. The organization operates in a feed-back system where “answers” are found in the PSPS.

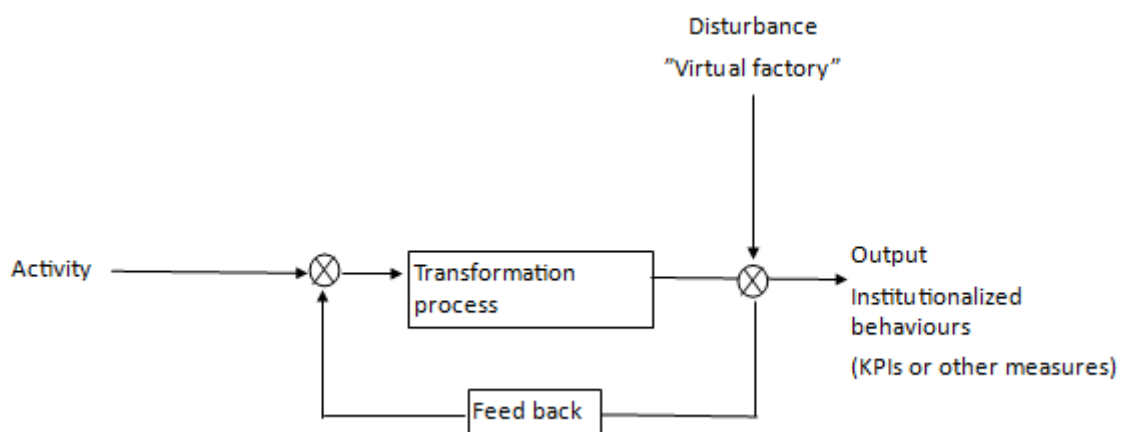


Figure 54 Feedback process driven by standards and legacy processes

The downside on the feedback control loop is, as discussed in the literature review that errors need to occur before corrective actions can be applied. Errors can in this context also be seen as substandard performance like the experienced appliance of too much resource to smaller issues (“tiger and

kitten”). Cook and Yanow (1993) suggest that organization learning happen when organizations in response to an external disturbance select decision rules to get to the preferred state (the reference). In the trajectory of the management group I noted a strong focus on incremental improvements, which I will suggest supporting Cook and Yanow’s (1993) argument. This can, in my control loop perspective (fig. 6), be the tuning of reference parameters.

5.4 What is next:

As a response to the facilitation finding I have suggested a communication at the “town-hall” meetings at the different units during the first quarter of year 2018. This broad communication to all units is part of the first “learning sets” (section 6.0). The communication shall address the identity ambiguity observed both during the first and second action research cycle. The learning sets were already planned as part of the research methodology and data sampling. My presence at the “town-hall” meetings will ensure the link from the LMIOP aspiration to the local aspiration and priorities.

As discovered during the analysis section it will become important to address the “virtual factory” as a journey of learning where the different elements of the aspiration are addressed. The objective is to create a common understanding of the aspiration model, which can be told by all employees. The common understanding and learning from the learning set shall, as suggested by Corley and Gioia (2003) create a new understanding of the LMIOP organization where the legacy systems co-exist with the “virtual factory”.

In the further implementation of the “virtual factory” it shall be considered how to work on the leverage that was seen during the search conference to counterbalance the risk of discontinuity (Berends and Lammers, 2010). The events seem effective in creating a movement within a brief time. The learning set can be perceived as another event with condensed structures, which could serve to boost the learning trajectory. Furthermore, the infusion of outsider input as suggested by Crossan and Berdrows (2003) could be suggested to be my inquiry to the management teams planned implementation of the “virtual factory”.

The insights created during the action cycle results in the following activities:

Insight	Action
<i>1: Manufacturing managers can be suggested to have needs for clear structures to support their daily management routines. However, these structures can hinder new explorative learning.</i>	The "virtual factory" and PSPS must be presented as complementary structures during the learning-sets. I shall promote the explorative thinking during the learning-sets.
<i>2: Transferring individuals from one organization to others will create new knowledge and from the cultural influence also change the cognition of the organization.</i>	I need to be conscious about the cultural changes that expatriations of managers can have (avoid driving a one-sided focus on exploitation).
<i>3: The learning trajectory seems to be a spiralling phenomenon driven and accelerated from the learning processes happening in the social context where individual intuition is shared, understood and refined at a group level.</i>	I need to ensure constant learning cycles to feed the spiralling. Next "event" is the learning-sets. Furthermore, I must encourage internal exploring and ensure focus on appliance of the monitors and use of virtual reality.
<i>4: Introducing knowledge from outsiders can change the organizations self-perception and perception of the environment.</i>	From the learning-sets inquiry I shall evaluate if the organizations need re-direction.
<i>5: It can be suggested that the use of metaphors both create a way-point to follow the learning trajectory but at the same time carries the risk of creating a one-sided perspective of the context. The constructed metaphor or artefact can only be suggested to be fully understood by the group creating the model.</i>	I will during the learning-sets ensure an inquiry regarding the constructed aspiration model and the developed metaphors to ensure that they have become part of the "language".
<i>6: It can be suggested that leadership direction and changing of organizational composition can facilitate to overcome barriers in change situations since new perspectives will challenge dominating perspectives.</i>	I need to consider leadership change in units where new and "can do" perspectives are needed (to be tested during the learning-sets).
<i>7: The effectiveness of facilitating media like Lego Serious Play is dependent on the antipathy or sympathy created. Shared meanings through story-telling might be lost if antipathy exists.</i>	At the learning-sets I will inquire in relation to the use of the created aspiration model and if the issued article had been helpful to the organization.
<i>8: Strong legacy based organizations risk to focus more on knowledge management than creations of new knowledge. The organizational members are searching in the "tool-box", which might prevent realization of full growth potential. However, the legacy processes can become the common experience as base for new knowledge creation.</i>	I need to focus on the co-existence of PPS and the "virtual factory". I need to utilize PPS as the exploitative element and current "common language" to foster further learning. This element will be part of the further roll-out plans to be developed.
<i>9: The use of events can be seen as a measure to counterweight the strong influence of legacy processes, which in daily practice can become dominant.</i>	I need to encourage events at all levels to benefit from the effectiveness of the temporally established structures. Next events are the learning-sets and an educational journey for the senior management team (Bosch in Germany).
<i>10: The focus on the exploitation of known knowledge and improvements of metaphors seems to direct focus away from explorative learning.</i>	I need to maintain management support to explorative activities. Especially I need to focus on internal exploration from events and educational journeys.
<i>11: Inconsistency observed was towards the research expectations of creating an explorative perspective. However, the new perspective created a disturbance and connections to other systems were not explained, which created a tension between exploitative and explorative activities.</i>	I need to focus on balancing exploitative and explorative focus from my own position. I have been focusing much on explorative activities, which seems natural to me. However, I need in the further roll-out to include the legacy systems as integral part of my activities.

6.0 The learning sets

In a 4I perspective (Crossan et al, 1999), the action can be suggested as part of the integrating process where I together with the management teams plan the roll-out of the aspiration model. In line with Berends and Lammers (2010) insights to discontinued learning trajectories it can be suggested that the learning sets also serves as revitalization of the Paris discussions.

6.1 What is in the data?

The following section contains the data from 1) learning set with the project groups and 2) the second and third learning-set with the manufacturing units.

6.1.1 Learning set with project groups.

I had planned the first learning-set with the project groups as the pilot session to test the effectiveness of the concept. The learning-set was expected to have only participation from the leadership teams, but reality turned out differently. The project groups had planned the session to be informative to a larger part of the project teams. The unexpected set-up resulted in my introduction becoming a broader presentation of the LMIOF organization and the concept of the “virtual factory”. The set-up of the meeting made the inquiry process difficult and the situation turned out to become a line of questions addressed to me as leader of the organization. The group was too large for challenging inquiry and the composition of the group created a context where not all participants knew each other. This could result in an environment where it can be difficult for organizational learning to happen due to lack of established trust (Senge, 1990).

The meeting structure was not supporting the objective of a learning-set, and the session became disruptive to my sampling of data. I felt that I had lost an opportunity to understand how the project groups worked with the implementation of the aspiration and with organizational learning. The situation resonates with Conklin et al’s (2012) research in terms of understanding the necessity of preparing the group.

6.1.2 Learning sets with manufacturing units.

The sessions with the two manufacturing units involved only the management teams who were responsible for the local implementation of the “virtual factory”. The following managers were present: AM4, AM5, AM6, AM7, AM8, AM9, RM1, RM2, RM3, RM4, RM5, RM6, RM7, RM8, RM9.

The dialogue got started easily in both events and I experienced a free conversation. However, the inquiry focused on what other part of the organization should take action on. The barriers were related to the connector pipes, and RM3 asked: “Who shall we call to provide help? Shall we reach out or shall others contact us?” The question was in the moment very surprising to me. I had the impression that our Paris event had created an image of that learning and sharing was our common objective. There seemed to be little desire to reflect on what could be done by each of the individual managers to create a context for learning and sharing. More appetite was on solving the practical issues of governance as suggested in RM3’s question. I was challenging the Russian management team in their focus on solutions and what others should do. I was expecting that my inquiry could start a more reflective discussion. The response from RM2 was: “we like to be concrete”. This answer indicated that the interest was on solving day-to-day tactical issues and could also suggest that at least RM2 did not want to expand the dialogue into a further reflection on what the local unit could do. My reflections at the time were related to Hill’s (2000) argument that manufacturing managers are dominantly exploitative thinkers. The inquiry was made difficult since the focuses became solution-oriented like creating newsletters, coordination meetings and encourage traveling.

The focus on outcome and “being concrete” resonates with the discussion on recognition and reward, which was brought forward during the learning sets both in Algeria and Russia. The Algerian managers were directing the dialogue towards the importance of recognizing the efforts of the individual and organization in the sharing and creation of knowledge. AM4 expressed that it would be important to the individual to see the benefits in a tangible way. I had experienced the same focus on recognition during the search conference in Paris where trophies were used as metaphor for expected recognition. The Russian management team came across very cohesive in their strong mutual support in the importance of recognition. It seemed of importance that their sharing was acknowledged as creating knowledge to the whole. This resonates with the created pledge (fig. 46) where the team see themselves as a source of knowledge for other units. It could be suggested that a common understanding had been created that the unit will become the provider of better practices. In Akinici and Sadler-Smith’s (2018) research this collective intuition and internalizing could be suggested to result in bias driving a perception of being knowledgeable. However, without any proven results since the Russian organization had not yet entered operation. It leads me to consider if the group had, from pure “training”, built a collective cognition of their own organizational competences. My reflections at the time of the learning-set were that the organization risk to create an organizational understanding based on isolation of knowledge. This is by Macpherson et al (2004) suggested to work against improved performance. The risk can in practice be that the organization will, to protect the created self-perception, reject knowledge from outside.

Besides the focus on reward I also experienced the need for perceived fairness in support. It was indicated by AM4 that organizational harmonization was needed. The suggestion was related to that not all units have the same support functions established. This can locally be perceived as unfair distribution of resources. I saw this discussion as out of the context but as AM4's attempt to discuss resource allocation. However, AM5 responded: "That is why the virtual factory is great; we can share resources across LMIOP". The response was a sign of that the idea and practical implication behind the "virtual factory" was understood. AM5's reflective statement was, however, not strong enough to generate an inquiring thinking process.

The reflection can also be suggested to be visible in that the Algerian managers saw themselves as receivers of knowledge. This perspective can be seen reinforced from the teams focus on the importance of installation of the interactive monitors. The Algerian management team saw the monitors as an important tangible element in promoting the idea of the "virtual factory". The monitors would become a tangible source of inspiration, which would encourage exchange of knowledge.

In an attempt to address the roll-out of the aspiration model, including the use of Lego, I asked the Algerian management team "what would happen if the managers brought the Lego model to the department meetings and discussed the content?" To my surprise this had already been tried in the quality department. AM6 explained that the first response had been: "Are you going to Paris to play with Lego". The same had been experienced at the Paris search conference where the Russian management team had expressed concerns regarding an output, which could be seen as a toy. My mitigating action was the forwarded academic article "Lego speaks" (Said et al, 2001), which should create a reassurance of that Lego was a recognized "tool". However, when I asked questions during the learning set in Russia regarding the helpfulness of the article I realized that it was not taken into consideration. Nevertheless, AM6's action created evidence of the practical appliance of the Lego model when explaining the presentation in the quality department. AM6 was pointing out that the individuals quickly started to suggest changes to the model, which could indicate that the Lego tool is intuitive (Said et al, 2001) even if not accepted at first.

AM6 explained how the metaphors built into the concept started reflections among the employees in the department. Watching and touching the Lego puts images to intuition. This can suggest learning in action or in the 4I concept (Crossan et al, 1999) that intuiting, and interpreting is ongoing. This action performed by AM6 was the first example of roll-out to the full organization. Because of the discussions during the learning set the management team suggested that the local aspiration model could be re-built based on more input from the full organization. From this reflection it can be suggested that I was observing the team learning together in the social context of the learning-set. The use of metaphors was reinforced when AM7 from the Algerian production, during the learning set, referred to the

tiger or kitten metaphor in relation to an ongoing discussion on future production volumes.

The little reflections I observed on the topic of learning and sharing during the learning-sets made the experiences a theme. The observation could be suggested to indicate that not much further energy had been put into the learning obtained during the Paris search conference. A few reflections were experienced as part of the Algerian learning set. Despite my confidence in the learning-set concept it did not provide the expected outcome.

In Conklin et al's (2012) research, the competences of action learning were formed over a three months period, which is an insight I could have used to calibrate my expectations. Conklin et al's (2012) research had, however, not been part of the literature review. The research article was found as an attempt to support and explain my findings during the learning sets. Furthermore, I had during my planning of the research methodology been reflecting on how the trust built during the daily practice had prepared the teams for the learning-sets.

In the days after the learning set in Russia I observed an increasing reach-out from the Russian unit and a willingness to provide support to other LMIOP units. RM3 was now showing action and was contacting the Algerian organization to suggest assistance (fig. 55).

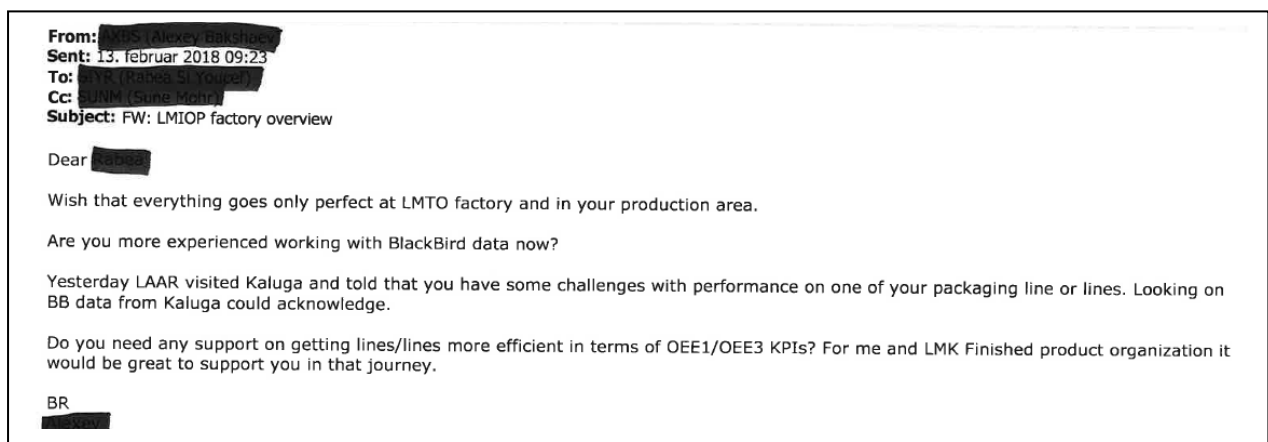


Figure 55 The Russian organization reaching out

The mail sent by RM3 leads me to consider that the learning-set had created some reflection. The mail can be seen as the intuitive reaction to being challenged on the use of “connectors” from the aspiration model. I had during the learning-set expressed my strong support to knowledge sharing and knowledge creation because of connections between the units. This action can be suggested as a practical example of Senge's (1990) managerial support to explorative activities.

From the three planned learning-sets I only saw partly success from two of the sessions. The session with the project group was a surprise to me since I perceived this group as the most mature individuals and individuals who all

have a long tenure within the company. The project group was consisting of individuals brought together based on the common task within the two similar projects, which is similar to findings in Conklin et al's (2012) studies. The project groups did not have the same daily social relationships as the manufacturing teams and like in the example in Conklin et al' (2012) studies this group first needed to build trust and a social context. During my choice of methodology, I had created expectations, which I now in hindsight and with insights from Conklin et al's (2012) research can see as unrealistic. Based on the misaligned expectations and lacking inquiry I have excluded the observations from the project group in the analyses section.

6.2 Presentation of data

In the analysis phase I have as in previous analyses sections applied Gioia et al's (2012) framework for categorization of data (fig. 56).

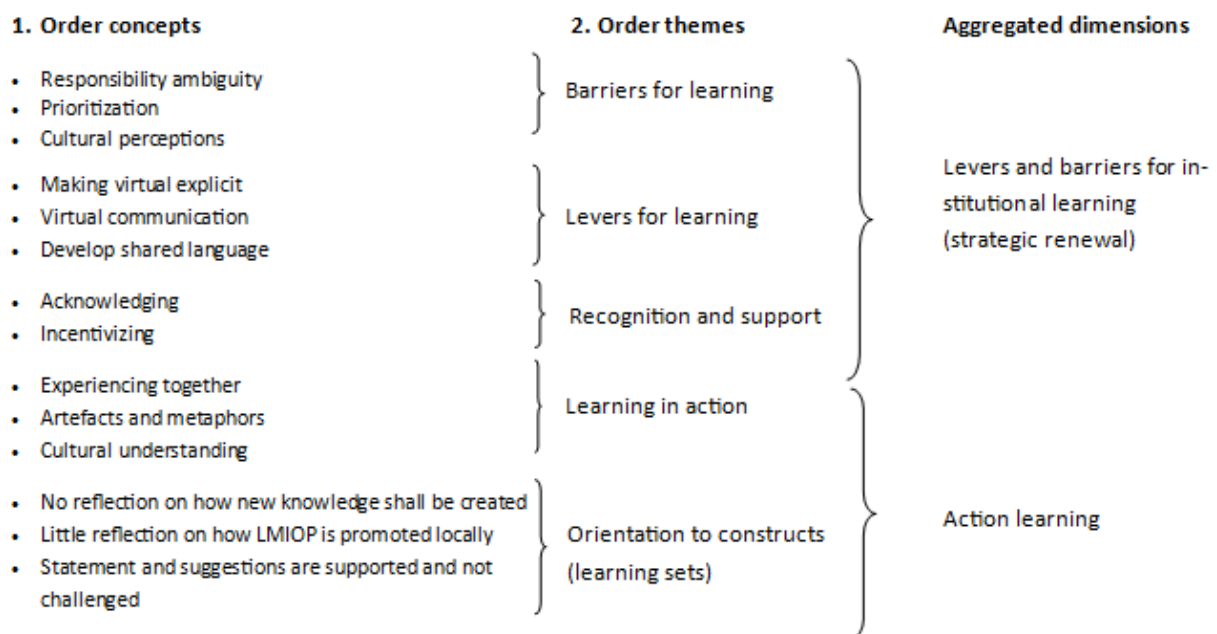


Figure 56 Codification related to the learning sets

The analysis is divided into two sections 1) Levers and barriers for organizational learning 2) Action learning, representing the aggregated dimensions.

6.2.1 Levers and barriers for organizational learning:

Barriers for learning became a topic during the learning sets and can be argued to repeat what I experienced during the search conferences. Focus at the sets was on “what others should do”, which could suggest that we were at the same stage as where we started the search conferences. In Paris I had the impression that a common understanding was obtained that barriers

could be overcome. However, during the learning-sets this phenomenon seemed to reoccur in full strength.

“Who shall we call to provide help?”, *RM3*.

“Travel to other sites to gain experience will be inspirational and acknowledge people”, *RM2*.

“We need a system to decide on priorities”, *RM4*

“Shall they contact us or shall we contact them?”, *RM3*.

“What is most important, helping others or succeed with our own objectives?”, *RM3*

“We wait for others, we need nothing”, *RM2*

The observation resonates with Berends and Lammers (2010) suggestion that learning trajectories might be interrupted by the environment and internal organizational context. The environment is different from the focused sessions in Paris and especially the internal context is different with the focus on day-to-day manufacturing. The barriers can be suggested to be linked to institutionalized learning from the past and lack of institutionalization of new learning (Berends and Lammers, 2010). The statements lead me to consider that focus was on lacking structures and it can be argued that the institutionalizing of the “virtual factory” was seen as weak. For example, *RM3* suggested a formal set-up of weekly meetings to help setting priorities on requests for help. *RM2* added “We need to receive more precisely addressed requests”. The statements relate to unclear structures “who does what”. Also, *RM3*’s statement regarding unclear priorities on contributing to the whole or focusing on own tasks can be suggested to be examples on lack of structures and institutionalizing (Berends and Lammers, 2010). I can, from the statements raised, suggest presence of structural ambiguity, which can prevent traction.

It can be suggested that the managers do not take the time to reflect on how learning shall take place in their daily practice and how learning could help to resolve the structural ambiguity as was experienced in Paris. The observation resonates with Hill (2000) who criticizes manufacturing executives for non-strategic thinking. The emphasis is directed to the day-to-day objectives, which is argued to reduce the explorative perspectives and become a barrier for creation of new knowledge (Crossan et al, 1999). The phenomenon can be seen from the Russian management teams’ discussion on when collaboration with other units is useful and when it would be better to focus on their own local achievements. Barriers can be suggested as structural and related to unclear priorities between when to serve the “whole” and when to ensure fulfilment of local performance measures.

The legacy processes seem to drive reliability and compliance thinking through a system of performance indicators ensuring daily deliveries. It can be suggested that the strong focus on the short-term gains and predictability is creating non-strategic thinkers with focus on action and outcome as suggested by Holmes (2008) and Hill (2000). The organization operates according to pre-defined measures and according to familiar procedures. The structure reinforces the exploitative thinking and can be seen as a practical example where the tension between exploitation and exploration favour the day-to-day focus. It can be suggested that the manufacturing managers silently reject the “virtual factory” to focus on the PSPS. The hypotheses can be argued to be supported in the observation of that no further activities have taken place between the search conference and the learning set. Focus had been on the institutionalized processes and not like it was seen after the first search conference where the original group of managers had created internalized operating modus based on the “virtual factory” concept. This observation can suggest that the physical distance of the organizations create a stronger need for structures, which the team closer to my daily practice had fulfilled from my presence. I can from the content suggest that Hill’s (2000) perspectives resonate with the dependency on the PSPS as a structural strong-hold. The system is providing the necessary guidance for manufacturing managers to perform their duty.

Referencing back to the balanced learning model (fig. 6) from the literature review it can be suggested that the structures and procedures founded in the legacy systems had created a stronger feed-back loop than what leadership, feelings, and artefacts could outbalance as feed-forward function. None of the activities (Search conferences) or artefacts (Lego models) was mentioned during the learning sets. The dialogue circled around structures and processes related to a decision-making process, “who should ...” and “how to ...”. The observation resonates with Greenwood and Levin’s (2007) suggestion that follow-up meetings rarely create the same dynamics as the search conferences. This suggestion can be connected to Berends and Lammers (2010) observations on discontinued learning where the changed environment was found to be a disruptive factor. Same finding was seen in the analysis of the first search conference and follow-up meeting. It can be suggested that what was present at the search conferences and missing in the daily practice, except for the Danish organization, was my own presence and managerial support to explorative activities (Senge, 1990). It can be suggested that focus on the need for managerial support has been underestimated as part of the application of the three organizational learning schools (fig.8).

Berends and Lammers (2010) suggest that the tension between the new learning and the legacy processes can trigger an interruption of the learning trajectory. However, the authors also suggest that reinforcing the feed-forward system by providing prior learning (creating structures and processes) could re-establish the balance. Moreover, it can be suggested that the legacy systems create accelerated learning due to the already created language and understanding. This leads me to consider that I have missed

the opportunity to build on the existing systems since my absence had signalled less support to explorative activities.

Levers for learning are suggested as the physical presence of the monitors.

“The big screens will become great inspiration to improve our performance”, “the monitors will create awareness of the need for knowledge sharing”, AM7.

“The monitors will show that the virtual factory exists”, AM5.

In the structural perspective the monitors will become a “room” for social interaction and supportive to organizational learning.

The structure will show that institutionalizing is ongoing and creating evidence to the managers’ statements. The monitors become a facilitating element in Senge’s (1990) thinking on learning how to learn together, since common experience across the full “virtual factory” is available as inspiration. This could inspire some to move away from the status quo, which Morgan (2006) suggests needs to be reinforced when organizations get trapped in the single-loop systems, as expressed in the need for priority towards the whole or own goals. The monitors and the chat function can be argued to break down the single-loop culture by creating social interaction, which Senge (1990) suggest must be present for organizational learning to happen.

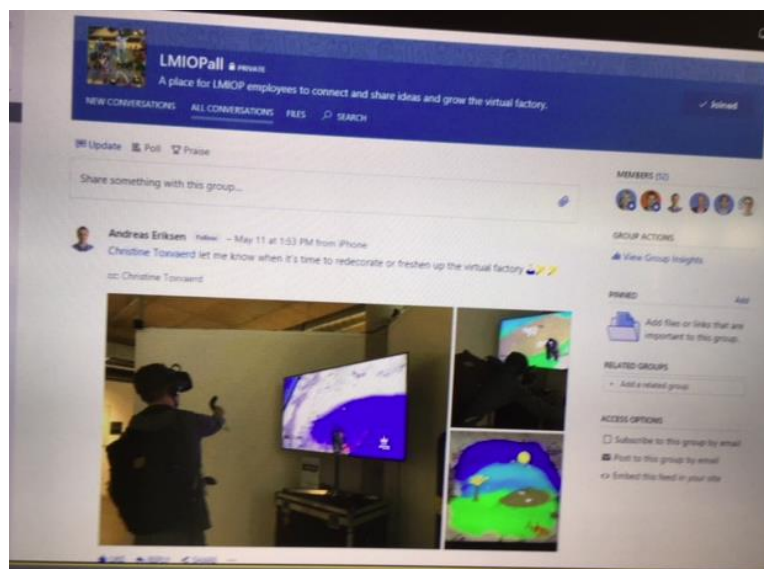


Figure 57 The chat corner on the monitors

The monitors make the sending and receiving parties active in a social context, which is familiar since it reflects the popular social media (WhatsApp, WeChat, and Yammer). The interaction across boundaries will become visible from the monitors and, as Dusya et al (2015) suggests, the boundaries will evolve along the dialogue between the participants. According to Leavitt (2011) the common experience can in this perspective

create the basis for the common language, which in the 4I context (Crossan et al, 1999) indicates organizational learning at a group level. The sharing of information and data on the monitors was during the learning-sets mentioned as means to understand own need for learning and in this way be seen as stimulating the expansion of the organizational capacity to create the desired result (Senge, 1990). The awareness of that performance is sub-standard (“People will see we have low OEE and will become motivated to improve”; statement from AM7) and that correction is needed could in Argyris’ (1976) perspective be related to the role of learning in decision making. The reflection on that correction might require new learning is in itself learning. It can be suggested that the tangible object, represented by the monitors, also create the structures and processes asked for by the management teams, and which Berends and Lammers (2010) suggest reinforces the institutionalizing of new knowledge.

Recognition can based on statements be suggested as a further lever encouraging sharing and creation of knowledge. This was mainly mentioned in the Algerian learning set.

“What is in it for me”, AM4.

“There must be a system to acknowledge the individual for contribution to sharing”, AM4

The theme had been visible during the search conferences (the trophy) and now mentioned during the learning-sets. The exploitative activities seen in the PSPS resonates well with Argyris’ (1976) thinking on the dominant interaction between individuals. This, he argues, is due to the recognizable link between cause and effect, which is not clearly articulated in the “virtual factory” in terms of rewards. The system resonates March’s (1988) suggestion that internal incentives are based on short-term results to create a clear link between activity and reward. This resonates with Holmes (2008) and Hill’s (2000) argument that manufacturing managers’ universe is limited to tactical day-to-day business and the need for PSPS as a structure within their practice. This observation can become important for the future roll-out of the “virtual factory”, since I might have to realize the difference between project development and daily manufacturing.

Insight 1: The analyses show that it seems necessary to create short-term incentives to support explorative thinking as well as short-term events to revitalize learning to support the continuation of the learning trajectory.

Insight 2: Learning sets will require a trained explorative inquiry process prior to the events. This behaviour might not be natural within interaction between manufacturing individuals.

Insight 3: The analysis shows that I have underestimated the need for managerial support and structure for organizational learning.

6.2.2 Learning in action

Learning in action is extremely important to understand since I can suggest that the research and analysis show the events as important drivers of organizational learning. The concepts were expressed in relation to experiencing together and exchange between units as result of the travel opportunities. Furthermore, the use of common language and metaphors were also seen as supportive to learning in action. This became evident when AM7 actively used the “Tiger or kitten” metaphor during the learning set. The cognition related to knowledge management is by Crossan et al (1999) suggested not to capture the cycles of action and acquisition of knowledge. Organizational learning comes alive in the social context of interaction between the individuals (King, 2009) and in the intersection between the three learning schools as suggested in the literature review.

I earlier suggested that our PSPS concept, which built on better practices, can be categorized as knowledge management since it focuses on sharing of known practices and incremental improvements. However, the assimilation that happens from the sharing of better practices can be seen to create common experience from where experiments can lead to new knowledge. In my extended definition this can be suggested as learning in action and certainly in the social context of exchange between the different units. The PSPS proven results under-line that learning in action is not restricted to explorative activities. However, it can be difficult to define the boarder-line between exploitation and exploration and understand if exploration is included in the PSPS.

My attempt to trigger exploration by the Lego tool as moderator was not taken into consideration, which could have been a reflection showing double-loop thinking and action learning as part of the learning-set. I was, inspired by Mezirow (1997), trying to help the organization to engage in a concept related to its own roll-out of the aspiration and by the article motivating them to critical assessment of the method. However, as argued by Mezirow (1997) adults often focus on practical short-term objectives, which are suggested to be coherent with RM2’s statement “we like to be concrete”. Mezirow’s (1997) perspective resonates with my earlier suggestion related to Holmes (2008) and Hill (2000) arguing that manufacturing managers seems to focus on day-to-day activities. However, I can also suggest that the observation resonates with Mumford’s (1996) concerns that action learning becomes too much action and too little learning.

Mumford’s (1996) criticism might in Hill’s (2001) perspective not be related to the methodology but rather to the way adults and especially manufacturing managers are interacting. Mumford (1996) suggests that our eagerness to work in real time, solving real problems, lets us to forget the processes and the learning coming from exploration. However, the PSPS concept contains, according to Morgan’s (2006) definitions, more than exploitative “tools” like the “kaizen” and A3 systematic problem solving, which should encourage double-loop learning. However, the statements from

the learning sets seem to focus on compliance with existing procedures and structures and could be suggested to result in that the learning-sets did not create the reflections and dialogue that I had expected. I perceived the session as a social context and as Conklin et al (2012) suggest, a process of sense-making and knowledge transfer. The institutionalizing methods, for example the Kaizen workshops, had me led to the perception that we were trained in the action learning process.

TOOL: KAIZEN

WHAT IS THIS TOOL?

The main idea behind Kaizen is that big results come from many small improvements accumulated over time.

Kaizen is a tool to encourage, capture and have employees implement improvements to their own work. Establishing a Kaizen system typically means integrating Kaizen work in existing boards and work processes.

A Kaizen event is a structured workshop approach addressing an improvement idea or problem. The Kaizen event is executed by a dedicated team in a pre-determined period of time (for example 3 to 5 days), and the solution is defined and implemented within the timeframe of the Kaizen event.

WHAT IS THE BENEFIT?

Kaizen helps improve and transform the organisation through small, every day, incremental steps that do not lose effectiveness over time.

A Kaizen system sets direction for employees to improve their process and enables them to implement improvement ideas.

Kaizen workshops deliver more rapid, effective and sustainable solutions, especially for problems affecting more than one area (department, shift, etc.).

LEADING PERFORMANCE INDICATORS

- Number of improvement suggestions per week increases or is sustained at the desired level.
- Implementation leadtime of prioritised improvement suggestions is short.
- Number of employees who have participated in a Kaizen event increases.

Figure 58 The PSPS definition on Kaizen

It can be suggested that Morgan's (2006) Kaizen perspectives does not resonate the practice described in the PSPS booklet (fig. 58). The tool-oriented perspective as seen in the PSPS does not express the same explorative angle as suggested by Morgan (2006). I find the discrepancy between the Novo Nordisk description of Kaizen and Morgan's (2006) perception as a good example of Mumford's (1996) concern that we as manufacturing managers and practitioners focus more on output than on the process.

Orientation to constructs is experienced in Conklin et al's (2012) research in collaboration with the Canadian health sector. The research shows that participants were trained in their groups over a period of three months where ground rules were understood, and trust created. I saw the LMIOIP

management teams as a context of trust and openness based on their daily close collaboration, which also can be seen confirmed in the ease and openness in the discussions. Also, the constant support to the suggestions from colleagues could be a sign of trust and openness. At the same time the behaviour can be suggested to prevent learning since the focus is on the simple feed-back (“I agree to what had been said”, “...and we should also have ...”).

The learning-sets became a forum for suggestions (newsletters, encourage traveling to experience what other units do, fast installation of the monitors, and organize prioritization meetings) and this seemed to be the common understanding from the teams. When I encouraged the teams to listen and question each other to explore the individual statements, the responses were rather support to what was already stated. The content resonates with Conklin et al’s (2012) observations in their research on action learning where they experienced a tendency to involve statements of issues or problems and further supportive statements as a release of emotions. The behaviour in Conklin et al’s (2012) research and in the analysis of the LMIOOP organizations seems to resonate with Akinci and Sadler-Smith’s (2018) research of the police force where similar behaviours were seen related to collective cognition and internalizing. However, in Conklin et al’s (2012) case, the trained groups managed to reframe the context to allow for inquiry to happen, which I did not succeed on in the cases of the learning-sets.

In my search for further explanation of the failing learning I decided to look further into Revan’s learning formula, $L=P+Q$ (Revan, 1998). The learning (L) was to a large extent absent in my sessions, but the programmed learning (P) should be present from the earlier search conferences and my introduction to the learning sets. Furthermore, the questioning (Q) was nearly completely absent from the equation, which will explain the lack of learning. However, in the exploitative perspective of PSPS it can be argued that the “P” was standing strong. This can also explain that the incremental learning happens without focus on the questioning “Q”. A possible reason for lacking reflections could be related to the unbalanced tension between exploitative and explorative activities. Referencing my balanced learning model from the literature review (fig. 6) it can be suggested that we are experiencing a control system with strong amplification on the feed-back loop and in this way the organization might see learning (L) as equal to the programmed learning (P). The PPS as a legacy can be suggested to become a standardized measure point maintaining the status quo (Morgan, 2006) and blocking the feed-forward thinking.

Insight 4: The manufacturing manager “syndrome” of mostly focusing on day-to-day business does not fit the explorative inquiry required for learning sets to be effective. The further support of the day-to-day focus from the exploitative “better practices” will create an unbalanced tension between exploitative and explorative thinking towards programmed learning.

6.3 What is going on?

The manufacturing organizations are today operating according to the PSPS concept and measure the impact of actions towards current “better practices” and correct accordingly (fig. 59). In the learning-set this came out as “we like to be concrete” and the search for channels to share “better practices”. The behaviours could in this way be suggested reflecting the created pledges.

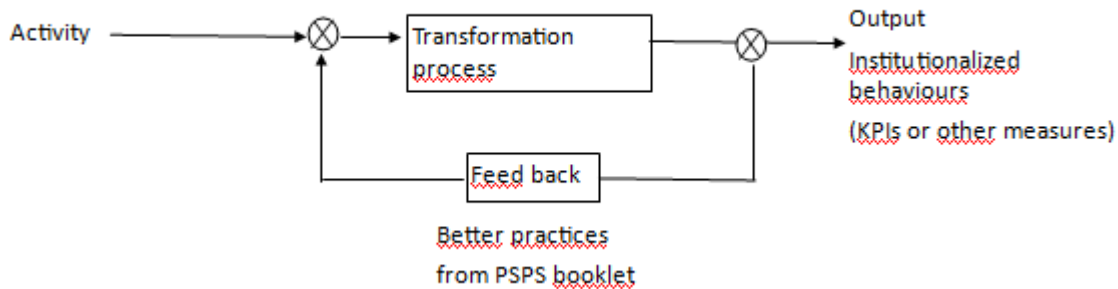


Figure 59 “we want to be concrete”

Argyris (1976) define learning as detection and correcting of errors. This perspective is supporting the feed-back behaviour we see from our performance indicator driven organizations. However, Argyris’ (1976) point was that an error is an opportunity to learn and not just to be corrected. This is an area that I had particular focus on when working with the senior management team where the educational journeys were creating increased internal explorative thinking. I can also see opportunities in Morgan’s (2006) perspectives on Kaizen and A3 systematic problem solving as explorative processes. These tools are already part of the PSPS, which can be suggested to create the base for further exploration. Furthermore, the analyses indicated that the intuitive focus of manufacturing managers might not support my overall objective of creating strategic renewal. As suggested from figure 59 the balanced exploitation and exploration that I created during the literature review (fig. 6) had been silently rejected in the daily practice.

During the analysis it became clear that some of the reasons related to the focus on the legacy systems are the missing structures and hereunder the support to explorative activities. I realized that the differences between the Danish unit, where internalizing was established, and the units in Algeria and Russia, focusing on PSPS, was my presence and constant support to explorative activities. The observation was reinforced when I was asking to the impact of the article I had forwarded as inspiration. It was clear that the article had not been considered as part of the further work on the “virtual factory” and confirmed the experience gained from the pledges.

In Algeria, the situation was somewhat different due to that no other strong system had gained legacy status in the way of operating. I experienced how the Algerian organization had been more experimenting with the “virtual factory” and the created aspiration model. Also, during the learning-set I can

suggest that the Algerian team was more reflective. The Algerian team discussed during the learning-set how more ideas can be integrated in the local aspiration if more employees were involved. The team agreed, based on AM6 experience that a rebuilding session had to be planned.

The differences I experienced in the Russian and the Algerian learning-sets show the strengths of the legacy processes and how cohesiveness can be created, which could risk blocking new ideas and new ways of thinking. The support that I can provide in my daily activities within the senior management team in Denmark had not been provided to the manufacturing units. In Russia the void was filled by the PSPS methods and in Algeria the team had been trying.

6.4 What is next:

The learning-sets represents the last action research cycle. The findings from the analysis will be brought into the overall research discussion following this section.

The discontinued learning trajectories observed during the learning-sets, related to the temporal setting around the “virtual factory” (Berends and Lammers, 2010), seems to be a pivoting element in the overall discussion. More focus is needed on amplifying the feed-forward process by making the “virtual factory” tangible to compete with the legacy systems. The structures, which will make the “virtual factory” tangible, are the interactive monitors, which were mentioned during the learning-set; and the managerial support to explorative thinking (Senge, 1990) that I as manager of LMIOOP can provide. I have already introduced the learning sets as part of my management meetings. In the initial phase I am focusing on the Algerian unit since new leadership has recently been introduced. This will create the balance, which Berends and Lammers (2010) argue is necessary to provide room for organizational learning and continuation of the learning trajectory (incremental improvements and new learning).

The balancing of the tension between the exploitative legacy processes and the “virtual factory” was in the analysis related to the balanced learning model (fig. 6). However, it was also in the analysis discussed if this representation was too static to represent learning from errors (Argyris, 1976). In the overall discussion it will be needed to further discuss the balanced learning model and as suggested in the analyses think more explorative towards systems mimicking the human experiences like “machine learning” as an advanced control system. Thus, it will be suggested that I as part of the further work revert to Morgan’s (2006) metaphor of the organization as a brain to describe such complex systems that goes beyond the simplistic control system (fig. 6). In the literature review I was applying this metaphor to cover the many aspects and complexity of organizational learning under organizational intelligence.

As the discontinuation and set-back became clear during the analysis it is necessary during the overall discussion to create a mapping, in the 4I perspective (Crossan et al, 1999), to follow the progress and set-backs experienced during the installed actions. The mapped structure can create transparency on the impact of the different actions and especially the learning set experience. However, it will also become an activity that might disclose that the organization is split into a manufacturing leg with one learning preference, and a development leg where other learning principles are needed. The observation is not evident from the overall LMIOP aspiration model and seems to call for a revision reflecting that more learning preferences will co-exist. Manufacturing units will focus on the exploitative PSPS and the project development units will focus on creating new knowledge and future ways of operating.

The insights created during the action cycle results in the following activities:

Insight	Action
<i>1: The analyses show that it seems necessary to create short-term incentives to support explorative thinking as well as short-term events to re-vitalize learning to support the continuation of the learning trajectory.</i>	2019 Balanced Scorecard, which is prepared during October 2018 need to contain incentives for organizational learning. Same shall be the case for the individual incentive program, which is prepared in December 2018.
<i>2: Learning set will require a trained explorative inquiry process prior to the events. This behaviour might not be natural within interaction between manufacturing individuals.</i>	Learning sets will be trained and performed as a pilot in the senior leadership team. The process is started as "Mette's corner" where one unit's problems are explained and discussed based on an inquiry process.
<i>3: The analysis shows that I have underestimated the need for managerial support as structure for organizational learning.</i>	More managerial support as physical presence will be needed from me as leader of the organization and owner of the "virtual factory". During second half of 2018 I will repeat my participation in the unit's quarterly meetings and revert to the learning-set principles.
<i>4: The manufacturing manager "syndrome" of mostly focusing on day-to-day business does not fit the explorative inquiry required for learning sets to be effective. The further support of the day-to-day focus from the exploitative "better practices" will create an unbalanced tension between exploitative and explorative thinking towards programmed learning.</i>	The phenomenon will be discussed on senior leadership meetings. The balanced scorecard and the individual incentive plan will from 2019 include targets related to explorative and learning activities (for example, educational journeys for local management teams, which were experienced impactful for the senior leadership team).

7.0 Conclusion of research.

The following chapter contains the conclusion on my research, a short reflection on my own experience as insider researcher, and an update on what has happened since my data gathering process ended.

7.1 Conclusion of research.

The goal of the research was to create a change to how the organization can apply more of the organizational capacity by focusing on organizational learning as the means to improved manufacturing performance. The main contribution lies in the understanding of how organizational learning in the concept of the “virtual factory” contributes to gaining access to more knowledge.

As a means of demonstrating my vision for organizational learning as performance improving construct I introduced three action research cycles. Each of the cycles were linked to the roll-out of the “virtual factory” that I had envisioned as the vehicle for my focus on organizational learning. Since I was anticipating the changes required I can suggest that the actions were representing the feed-forward process in my balanced control diagram (fig. 6). Further, it can be argued that the feed-forward process created a disturbance in the dominant feed-back process (the PSPS legacy process). It can be suggested that I was balancing the exploitative and explorative activities.

The research shows how organizational learning develops from an individual level to the group level within a context of temporal and social structures. The observed development is suggested to resonate with Crossan et al's (1999) 4I model for development of organizational learning. Especially the event-structures seemed to create a context suited for balancing the exploitative and explorative perspectives, which was seen in the development of the aspiration models. The model of the “Three learning schools” (section 2.4.4) contains the elements of supporting explorative thinking, social interaction, experience through experiments and action-oriented learning, which in the interaction creates the structure for organizational learning. As practical examples of the tension I experienced the focus on short-term performance indicators linked to group and individual appraisals. Especially in organizations with strong focus on the monetary rewards like Novo Nordisk this tension was expressed in the focus on local achievements instead of the “whole”. The tension could be less interesting in long-term explorative activities. During the research, the phenomenon was experienced when commitments were to be reflected in pledges and balanced scorecards. The explorative activities were only committed after applied management support (Senge, 1990), which is one of the elements highlighted in my “Three learning school” model. In the balanced scorecard this was expressed as the

agreement between the Russian and Algerian organization on knowledge sharing. This concrete example balanced a tension that otherwise will hamper the organizational ambidexterity (Birkinshaw and Gibson, 2004), which is one of the capabilities we need to build to increase performance. The succession of the action research cycles shows how the organizational learning trajectory can contain discontinuities in the underlying learning cycles, which could suggest a fragmented outcome. The observations resonate with Berends and Lammers (2010) observations on discontinuity in organizational learning. I can suggest that the discontinuities are related to the tensions in the balancing of exploitative legacy processes and new explorative learning processes. The dynamics were found to be closely related to: the balancing of the organizational ambidexterity; the compressed social contest of events; and the daily practice strongly influenced by legacy processes. Tension can also be suggested to be arising when temporal structures create dominance at more levels, as when the first construction group forced their internalized organizational perception to new individuals and groups.

My research illustrates the value in insights of real-time action research to uncover the dynamics of organizational learning. The actions allowed me to trace the overall trajectory of organizational learning and the learning cycles that either failed or was supportive to further progress. I can suggest that my research highlights the time dimension in organizational learning, which discloses that the spiralling effect tends to consist of successes, failures and set-backs as discussed in section 5.3. Figure 60 illustrated the learning trajectory for the development in LMIOP over a period of approximately one year. Although the “saw-tooth” curve can be suggested to represent a linear progression I have earlier discussed that this simplification consists of underlying process of learning cycles. I have illustrated the non-realized activities related to barriers for learning (fig. 50) and the spiralling combination of individual and consequence learning cycles (fig. 53). This forward and backwards dynamics between individual, group and organizational levels resonates with Crossan et al’s (1999) description of the dynamics underlying the seemingly linear 4I learning process. The authors suggest the dynamics illustrated by the tension between feed-forward and feed-back processes. Feed-forward learning at the individual level meets feed-back from the group and organizational level from already institutionalized knowledge. The interactions are in Crossan et al’s (1999) perspective and in my research suggested as ongoing between all levels and all phases in the learning process. This is illustrated in the LMIOP learning trajectory (fig. 60) in the constant shifting between individual and group level, which is suggested as an ongoing process ensuring the “fuelling” of the learning process.

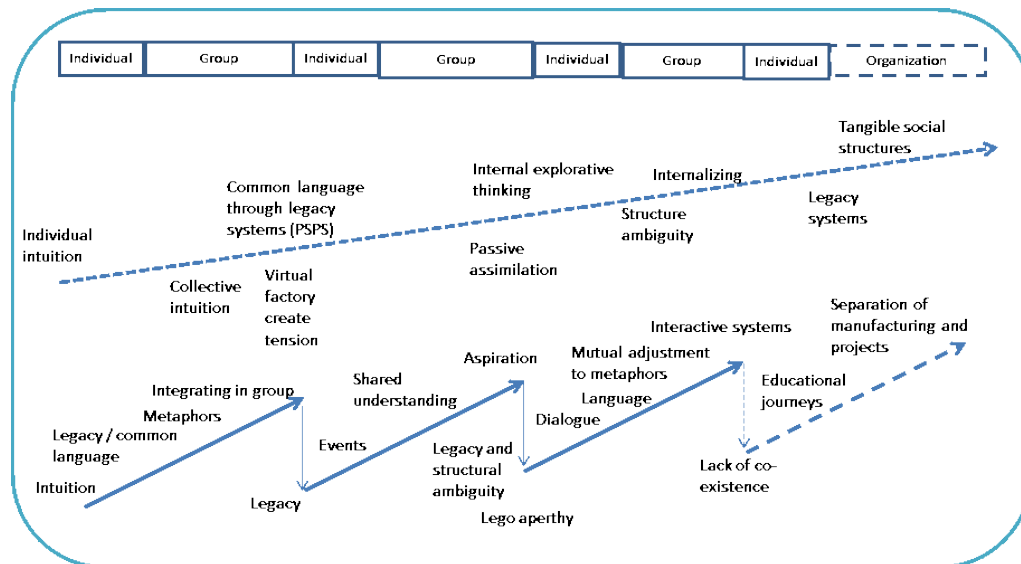


Figure 60 The LMIOP learning trajectory

From the trajectory I can suggest that the LMIOP learning process has been messy and a process where especially the legacy processes and the temporary structures during the events were powerful. The events created the context for balancing exploitative and explorative activities due to the compressed timing, controlled experiments and isolation from day-to-day performance perspectives. However, during daily practice I noted how the sub-conscious behaviour based on the institutionalized legacy processes created the manufacturing manager behaviour (Hill, 2000) focusing on the legacy processes. The behaviour could be a discontinuation of the organizational learning curve, followed by a set-back, and creating a “saw tooth” pattern of progress.

Despite the discontinuation and set-back, figure 60 illustrates that learning does not stop but continues by exploiting known knowledge and sharing of better practices from the legacy systems. In the figure each “saw-tooth” represents an individual learning cycle. The top-bar suggests that the learning processes observed within LMIOP all started with the individual and developed to group level. The dotted line indicating a further progression towards the organizational level is suggested to show the development I have experienced in the time after my data collection phase. The constant progression is on the figure indicated from the slightly higher starting position for each “saw-tooth” and the up-going trend on the dotted line indicating the accumulated learning where legacy systems are seen both as enablers and disablers. In this way I recognize that organizational learning can be seen in broader definitions as I have suggested in the literature review (section 2.3). Furthermore, the figure can also be suggested to resonate with Romme and Dillen’s (1997) perspectives on organizational learning as a continually evolving process where knowledge is exchanged and accepted at group level (discussed in section 2.5.2). This mechanism was observed as part of my research cycles and can be seen indicated on the top bar where I have indicated a continued exchange between individual and group level. In the longer time horizon, the top bar indicates a conversion to the organizational level. From Crossan et al’s (1999) definitions I can only

claim learning at the group level since it is suggested that the separation between individual and organizational learning is the process of institutionalizing. In figure 60 this is indicated with the dotted line to indicate a current development taken place after the research period, which again highlights the time perspective in organizational learning.

The isolated focus on exploitation can for the manufacturing units and a company perspective be an advantage in the creation of predictability, which can be seen in compliance with the company's performance indicators for quality and deliveries. Figure 61 shows how the exploitative activities have increased the day-to-day performance. The collaboration across the “virtual factory” can be seen to drive significant increases in manufacturing performance (the upgoing trend curve) and show the importance of the exploitative learning from the legacy processes (PSPS).

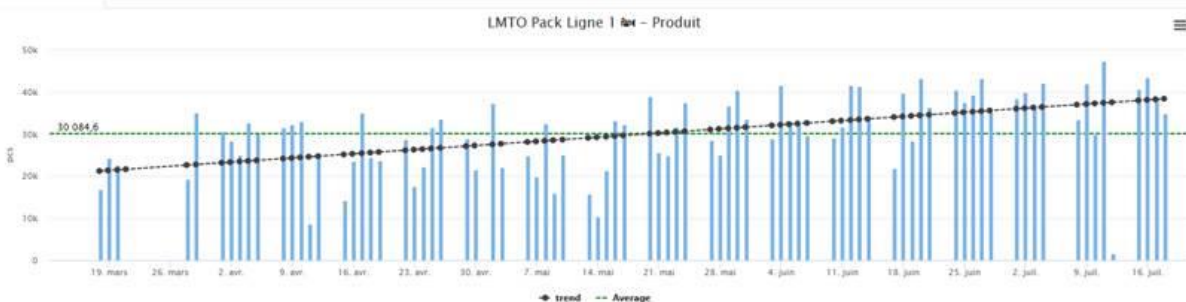


Figure 61 Performance improvements (March – July) based on sharing of better practices

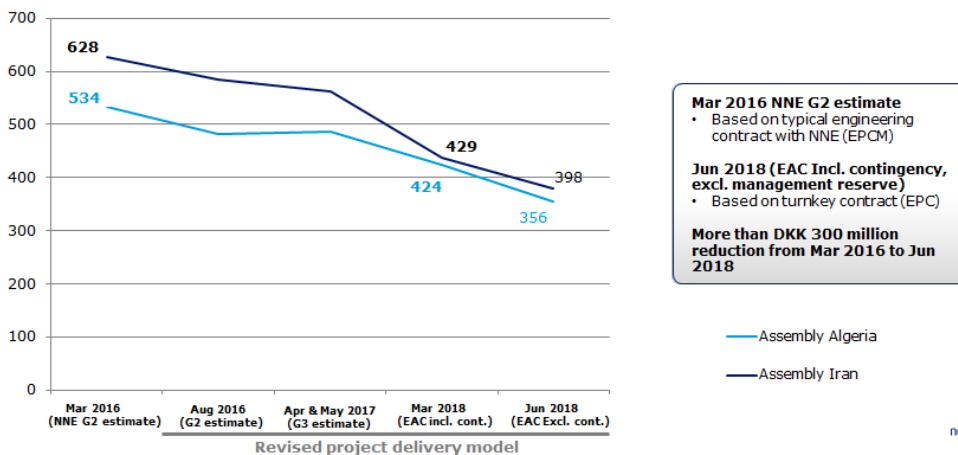
The figure shows how the management support to a perspective on serving the “whole” has encouraged the Russian unit to share knowledge with the Algerian unit, resulting in increased performance on manufacturing parameters (fig. 61). The exchange of knowledge between individuals and between groups has created common understanding of the exploitative activities, which earlier have improved the performance in Russia. I suggest that this exchange dynamics created the internally explorative thinking in Algeria that facilitated the assimilation of new knowledge and consequently improved performance.

Furthermore, the internalizing I experienced especially within the senior management team has, as suggested by Senge (1990), become an element of managerial support to the overall aim to achieve explorative thinking. This is seen in the daily practice where the “virtual factory” is part of the vocabulary as a means for performance improvements. I see internalizing as part of the cohesiveness created in the smaller group of senior managers, which also in the aspiration construction (Lego model) was shown as the group on the raft. I suggest that the raft is the group's explicit acknowledgement of the created cohesiveness and internalizing (the raft is a supporting object). The bridge-building function, which is indicated in the aspiration model, is seen in the daily practice where the group currently is the pivoting point for new activities. The internalizing has become explicit using objects and metaphors. The research also disclosed the flip-side of internalizing, which I experienced as part of a cohesive group setting the organizational agenda. The result was passive assimilation and lack of common experience as seen as disablers in the learning trajectory (fig. 60).

Internal exploration has become an increasing phenomenon within the LMIOP management organization. Hoang and Rothaermel (2010) suggest that pursuing benefits from external experiences requires development of internal explorative capabilities. This triggered my interest in arranging and supporting educational journeys. I saw explorative thinking as a way to drive new ways of operating, which I will argue has been successful based on the obtained results (fig. 62).

Reduction in cost estimates for LM projects

Cost estimates have reduced significantly over time for assembly and packaging projects in Algeria and Iran



Local Manufacturing initiatives

Cost reduction and simple solutions



Figure 62 Improvements in performance related to new explorative thinking

Figure 62 illustrates how explorative thinking, and consequently changed processes, have been driving a reduction in investment cost by approximately 35 percent, which equals an amount sufficiently to finance a third similar facility. The reductions have been achieved through new ways of thinking about contracting engineering and construction activities. The further reductions related to local manufacturing initiatives are related to new ways of selecting requirement to establishment of facilities as well as new ways of operating like cross utilization of resources. The activities all refer to the D&S Business Plan initiative number five as discussed in section 4.2.2 (fig. 34). I can argue that the internal explorative thinking has facilitated the assimilation of new knowledge from external experiences. New

meanings can be said to have been created (Corley and Gioia, 2003) as new ways of thinking and the changed activities has shown monetary results. The learning trajectory for LMIOP fulfil in this way the aim of creating new knowledge and increased performance as part of the path to strategic renewal (Volberda et al, 2001; Bapuji and Crossan, 2004).

The learning obtained especially within the management team has shown that the social context is a prerequisite for organizational learning to happen. The research also revealed that there was a need for structures to maintain the context obtained during the events. From the analysis it was clear that a permanent social environment was needed to ensure the structural support and to create common experiences. The interactive monitors and virtual reality are elements in the integrating phase of Crossan et al's 4I learning concept and is one of the elements to secure a "social room" for all employees in the LMIOP organization and a sustainable learning environment towards improved performance. These structures are suggested to answer the research objective. The "social room" is also the tangible evidence that all have access to performance data as indicated by the ladders to the control tower on the aspiration model. I can suggest that for the "social room" to be effective a common language is required. In the research this was seen based on the legacy processes. However, I also noted how the use of artefacts and metaphors became enablers for establishing common understanding and a new common language (the raft with the management team). The aspiration model has become a daily reference as well as the metaphors have become part of the LMIOP vocabulary.

I had created a research program with the objective to improve the utilization of the "installed" capacity within the LMIOP organization through organizational learning. The research shows that LMIOP is progressing on a journey of organizational learning where the use of metaphors has created a shared understanding of the aspiration, which can be seen from the common use of the metaphors created at the search conferences (the tiger and the kitten). The understanding has moved from the individual level to the group level (the management team). The pattern shows the progression from the individual's intuiting (recognizing a problem of magnifying problems) through the interpreting where the full group understands the meaning of the metaphor to an integrating where the metaphor is integrated and improved on each of the aspiration models (the fenced tiger). The new experience has become coherent and shows collective actions, which according to Crossan et al (1999), shows learning at the group level. Knowledge is exchanged and accepted by the individuals and continually evolving (it was agreed that the problem must be stopped and the "fenced tiger" was created). Romme and Dillen (1997) suggests that this process shows evolving organizational learning. The process can only be seen at the group level; however, the inquiring process observed during the educational journeys and the inclusion of new managers could indicate a level of internalizing. The managers were questioning organizational learning at Maserati by using their own experience as a reference. I have also observed increased interaction in the social context, which can be related to organizational

learning and an increased performance of the group. There are not yet structures in place that will ensure continued organizational learning, which Crossan et al (1999) refer to as institutionalizing. However, at a group level an improved utilization of the management team has been obtained and the structures related to the “virtual factory” seems to support organizational learning. I can suggest that the observations during the research and the post-research behaviours support that organizational learning is ongoing and that signs of increasing performance have become visible.

I had further from the research proposal raised guiding research questions related to the increasing unit cost. The expectations were that the increased collaboration across LMIOIP would allow the managers to exploit knowledge by applying better practices and explore opportunities from better principles. Figure 61 and figure 62 can suggest that this new thinking has been applied. I realize that the observed improvements have been through what I can suggest as intra- and inter-organizational level. This can according to my literature review (section 2.5.1) indicate that organizational learning has been institutionalized. However, I do not see changed procedures or structures in place, which could indicate that the improved operating processes are related to internalizing at group level (Akinici and Sadler-Smith, 2018). In this perspective I can suggest that part of improved performance can be found in inter- and intra-group social context, which I did not find during the literature review. However, the supportive objects (raft and bridge) indicates an explicit common understanding, which is further supported using a vocabulary related to the “virtual factory” and learning.

This was particularly clear during our educational journeys where we were learning from better principles outside the pharmaceutical industry. The literature (Jones and Macpherson, 2006) suggests this intertwining as a mechanism at the organizational level. However, I will suggest that my observations show evidence of the intra- and inter-organizational behaviour, which could be driven from the “virtual factory” thinking and the managerial encouragement to explore (the educational journeys). My research has not been focusing on gathering information on this part of learning; however, I find the observation important for further observation in the search for expansions to the various learning models. I can from the content and achieved results suggest that the ongoing changes are fulfilling the ambitions stated in the introduction chapter. However, the findings can only be related to the specific situations and especially the performed events. Therefore, it is still be difficult to conclude on the sustainability and the further progress towards institutionalizing. This will be an ongoing challenge and one that I will continue to pursue after the conclusion of the research project.

The overall conclusion leads me to suggest that the overall research questions have been addressed, as discussed below.

How can organizational learning (strategic renewal) be implemented within LMIOP to obtain increased performance seen as reduced unit cost resulting from reduced investment cost and increased manufacturing output?

This has been fulfilled both in terms of increased insights to the theories that I as practitioner have applied to strengthen organizational learning and through the empirical data on manufacturing performance and cost reductions. The increased performance suggests that improvements have been achieved by implementing activities to support organizational learning, and that the changes in language and use of metaphors to describe the goals of the virtual factory suggest a new way of thinking is evident in the factories.

Furthermore, I had as result of the literature review raised six specific research questions, which are addressed below.

1) How can the construct of organizational learning become integrated within daily activities leveraging the organizational performance?

Firstly, the daily integration can be suggested to already to be existent through the legacy processes (PSPS), which is already part of the manufacturing structure in the sharing of better practices. The research suggests that manufacturing units are oriented towards exploitation, which resonates with the reviewed literature (Hill, 2000; Holmes, 2008; Mezirow, 1997). Secondly, I suggest that my understanding and appliance of “three learning schools” model allows me to create the structures to support both the exploitative and explorative aspects of organizational learning. I observed that it was possible to influence the project organization towards explorative thinking, which can be seen as successful from the reduced investment cost (figure 63). This change can be seen following Hoang and Rothaermel’s (2010) focus on internal explorative thinking. Thirdly, the social context of re-building the aspiration model can be seen as integrating the theories with the observations in the accepted structure of separating manufacturing from projects, which can be the common language for the acceptance of the co-existence of exploitation and exploration.

2) How can I enhance the performance in the LMIOP network of manufacturing units in a constantly changing business environment?

From the experiments it can be suggested that the dynamics in event structures support organizational learning and consequently strategic renewal. The “virtual factory” can be suggested to create the context for the dynamics within Crossan et al’s (1999) learning model. The insights gained about learning processes through the research events and the statements in the literature (Crossan et al, 1999; Macpherson and Jones, 2008) that strategic renewal is the absolute outcome of organizational learning have created an awareness of the importance of the dynamics embedded in using the verb “ing” (intuiting, interpreting, integrating, internalizing, institutionalizing). Standardized versus standardizing creates the dynamics ensuring the constant renewal instead of application of the status-quo. It is

important to understand that institutionalizing is not an end-point but a means to capture learning and create capabilities related to strategic renewal.

3) How can I create a conscious strategy for balancing exploitative and explorative initiatives, and what competences are required within LMIOP?

The research can be suggested to show that competences related to exploiting are well engrained with the legacy processes. However, the explorative behaviour needs managerial encouragement as suggested from my “Three learning school” model. During my research I have observed how impactful events, artefacts, and metaphors were in the change process. The research suggests a conscious focus on the balance of exploitative and explorative activities as a competence to be embedded in the organization. The construct of the “virtual factory” can be seen as the conscious strategy and structure, which can be seen, supported in my “Three learning schools” and resonates with Macpherson and Jones (2008) and Shrivastava (1983) suggestion that organizational learning as institutionalized behaviours can be facilitated through objects and artefacts. It can be suggested that the results of strategy are reflected in the achievements seen in figure 61 and figure 62. However, the time perspective in organizational learning will show if the “virtual factory” structure continues to provide the room for learning. Experience and historical data from the model will allow for later improvements of the “virtual factory” model.

4) How do I apply the elements of the “Three learning schools” to create an intersection for organizational learning?

The “Three learning schools” creates the input for the structures that can be suggested to have been implemented as part of the “virtual factory”. Examples are the social interaction through the chat corner on the giant monitors and the support to explorative thinking through the educational journeys and experimenting. The elements of the “Three learning schools” can be suggested to be the practitioner’s appliance of theory seen from Leavitt (2011) and Senge (1990). The combination creates the intersection (fig. 8), which I have applied by creating the structures (the “virtual factory”, the giant monitors, the separation of manufacturing from projects), the managerial support to explorative thinking and experimenting (educational journeys, entry to use of robotics and virtual reality).

5) How can I utilize the power of artefacts, objects, and metaphors to strengthen the feed-forward in the balanced learning model?

The embedded impact of artefacts, objects and metaphors was found described in the literature (Macpherson and Jones (2008); Shrivastava, 1983) and the increased awareness of organizational ambidexterity (Birkinshaw and Gibson, 2004) together with my balanced learning model (fig. 6) created insights to the importance of the feed-forward process. I experienced behaviours that could indicate too weak amplification of the

feed-forward signals, which in combination with the strong legacy processes created ambiguity. The observation will suggest that I increase my focus on making the “virtual factory” more explicit through visible structures, which will amplify the feed-forward signal. The metaphors invented and agreed during the events are visible as the aspiration models are exposed in the office environment. These metaphors can be referenced as well as the constant use of the wall-painting on presentations. This behaviour is a constant reminder of the explorative focus created during the events.

6) How do I ensure that my change process will prepare the organization for mastering strategic renewal as means to sustained competitiveness?

I have throughout the research process been articulating how I see organizational learning as a means to obtain strategic renewal and sustained competitive advantages. It can be suggested that my constant disclosure of the process and the involvement of the organization creates the purpose for change. The literature review suggests that organizational learning is the means to strategic renewal (Crossan et al, 1999; Macpherson and Jones, 2008). This insight from the literature and the current observations (after termination of the data gathering process) leads me to continue focusing on the “virtual factory” as a vehicle to drive a process towards organizational learning. The “virtual factory” provides the structures, which during the events were cornerstones in the learning room. However, I have also experienced a need from the organization that I articulate the changes. I experienced much interest in my research and what the outcome could be. The experience leads me to focus on the articulation of improvements that has been obtained and how we will continue the journey of constant renewal.

The review of the research questions leads me to suggest that my work as insider researcher has accomplished my objectives. The combination of applied theory and research experiments has created an understanding of the importance of the co-existence of academia and practice as well as my own development as practitioner.

7.2 The experience as internal researcher.

“I was blind, now I see”, is a quote from the movie “Limitless” at the time when Eddie Morra takes the drug that produces enhanced mental acuity. The quote could be suggested to represent my own journey during the research within my own organization. I was the practitioner with a desire to change the organizations mental acuity and ability to utilize a larger part of its “installed” capacity. I did not know how to do that but knew that I needed to do something. The movie “Limitless” created the spark that has been driving me towards the brain as metaphor for the organization and the thinking about organizational intelligence. The idea and the metaphor have been further maturing throughout my participation in the University of Liverpool DBA program.

I was entering the DBA program with an idea that it would become an educational journey, which I expected could improve my leadership skills. I saw the research as an opportunity to make the changes to my organization that I had been thinking about, while applying perspectives from a world outside my daily practice. The research would become an opportunity to build bridges between academia and practice by applying insights from the preparatory courses. I believe that the insights gained had prepared me to become more reflective and more focused on the “whole”. This perception was in line with the feedback that I had received from my peers in my practice during the first years on the program. Furthermore, I saw the appliance of social science in investigations of my business and management activity as a chance to see things from a different perspective. I started to ask myself the questions like: “Where are we going?” and “Do we want to be there?” I was asking questions about an organization that I thought I knew well, and not least about my own activities as manager. I saw the research as a chance to change or improve both our way of operating but also my own practice in the management activity. The action research was an opportunity to be actively engaged both in the change and to investigate what was going on while changes were applied. How did my ideas impact other individuals within my organization?

I realized that I was moving into a territory where my experiences were very limited and could only be said to be obtained through the preparatory courses. The lack of experiences created frustrations in several cases and highlighted my lack of understanding of the context. For example, cases where I did not see or understand what was going on, while actions were taken and later understood that I had missed opportunities of collecting data. Other examples could be related to the analysis processes, like the categorization of my findings, where I discovered the importance of inquiry and difficulties in self-inquiring. The thesis write-up was at times a frustrating process due to experimenting with the auto-ethnographic writing style that I found far from my daily practice but related well to the action research methodology. My inexperience with action-research and auto-ethnographic writing style can be seen in my tendency to write in closed loops where I get “things out of the head” as I move through the iterative analysis process. This impairs a risk that I might lack a follow-up on information or conclusions created as part of the iterative analysis, which I see as part of action research. Also, the situation of being owner of the change process and being part of the subject that I was investigating created a constant reflection on the biased perspectives that I would apply and maybe not discover.

Being objective would be impossible when working alone and being passionate about the topic. I found the engagement problematic during the search conferences where I at the same time was an active participant and researcher. The experience was especially clear during the first search conference where I worked with a small group of members of my management team. The interaction with the group resulted in that my

eagerness hampered the ability to follow what was going on and to ensure the necessary notes in my research journal. While I was taking notes, the process and activities continued. During the process I found out how I could strengthen my notes by documenting the situations in pictures. It was not new to me to take notes; however, the details in the notes became apparent to me. “Who said what and why, and what was the reaction”. This was new to me but became an effective process as the research progressed. As my research journal and notetaking became better I also experienced a more interesting process around my reflections on the different situations and linking them to my insights from the literature. I found this process especially important since some observations were little sense-making to me in the situation. For example, I misunderstood the situation where DM5 constructed a metaphor next to the common aspiration, and I felt irritated in the situation where a new member of the management team challenged the “virtual factory”. In both cases I needed to think about my own person and my involvement in the research before I could make any reasonable sense of the observations. I needed to revert to the reflexivity that I had learned during the preparation courses.

The search conferences were my first experience with the action research cycle and I believe that the experience was valuable for the next steps of the research and the continuation of the change process. I realize that my own participation in the process had led to that my observations during the initial phases were limited from my capacity to lead, build, and doing research at the same time. It can be seen as a risk being the only researcher present in the conference and more generally in the activity of action research. The initial phase where knowledge about metaphors was created and explained was especially difficult due to my own participation. My engagement in ensuring understanding of the construct of the “virtual factory” might have distracted the ability to observe behaviours around me. In the continuation of the change process I will ensure to include more observers and note-takers at the events. This will allow me to engage and lead the process.

It can be suggested that I am highly dependent on the interaction with my colleagues from my daily practice and as argued by Anderson et al (2015) my work must be expected to have implications for the participants and if successful also for the full organization. However, can I be seen to be too engaged with the directors physically closest to me in my daily practice? I noted through the process that a group with strong internalized values and beliefs were created around our Danish offices. This sub-structure resulted in that I had not ensured all participants had the same experience in creating an understanding of LMIOP and the meaning of the “virtual factory”. It can be suggested that my focus had been more on progressing than on ensuring a communication to all parts of the organization to ensure common understanding. My behaviour could be resonating with Macpherson et al’s (2004) suggestion that isolation of knowledge resources works against improved performance. I have been focusing much on developing the concept together with the senior managers close to me in the Danish part of the

organization and in this way excluded knowledge resources from other areas. Also, in Crossan et al's (1999) 4I perspective, I can be said to have missed the opportunity to create common understanding since I have been focusing on a limited group of managers.

Another surprise was the influence of my own thinking. As suggested by Berends and Lammers (2010) my dominant position within the organization created a situation where I could have been influencing the intuition of the individuals and creating dominant thinking within the organization. Berends and Lammers (2010) argue that power relations can enable and deny access to learning practices and influence the organizational learning processes. Could my isolated early focus on the managers close to me in the Danish organization have been denying access to learning practices, and can the current push for implementation be my own way of feeding my intuitions forward? The situation can be suggested to resonate with the phenomenon from Crossan and Berdrow's (2003) study of Canada Post where a senior executive via feed forwarding his intuition ultimately got it institutionalized, while other less senior groups experienced a limited feed-forward flow of their ideas. Could my personal interest in the "virtual factory" be hindering other perspectives?

I realized that I had created a feed-back system measuring the pledges towards my own expectations. I could be seen to apply peer pressure on the individual units based on my own desire to push the idea of the "virtual factory". I did not experience the coherent actions, which Crossan et al (1999) suggests as sign of shared knowledge. The appliance of pledges as mini events to support continued learning along the trajectory created at the search conferences seemed to have failed. However, I realized that the organization, both in beliefs and practice, was consistent to the legacy processes, and that the experienced inconsistency could be the tension between the exploitation and exploration in terms of the "virtual factory". However, the company's general focus on open and honest communication and the discussions and challenges I experienced do not indicate that my presence or formal position have had major impact on behaviour or attitudes. The tendency has more been towards an interest in my research and especially in experiencing the change. I can suggest that the organization and I have had a common interest during my research period.

7.3 Continuation of research impact.

Based on the experiences from the research, and especially the learning sets, the activities have continued and in the same way as during the research period.

During the research and the learning sets I discovered that there was a difference in thinking between manufacturing units and the project development unit. The learning could not be simplified in the simple control model that I had created in the literature review (fig. 6) and the complexity

could better be described in a metaphor like the human brain (Morgan, 2006). I decided that the original aspiration might have expired and invited the senior management team for a “re-built” session. I was concerned about what the outcome might become; however, my reflections at the time were that the organization had undergone so many changes that renewal was needed to ensure continued common understanding.



Figure 63 The 2018 aspiration model

The changes were less dramatic than I had expected, which could be reflected in Corley and Gioia’s (2003) suggestion that changes, and learning requires that new meanings are constructed for what we did before. We had got familiar with the aspiration and the “virtual factory”. DM2 expressed: “I hope that there will not be too many changes”. The changes were mainly related to a split between the project development and the operating units. The former with focus on explorative activities and the latter exploiting the better practices mainly described in the PSPS. The two areas are connected over a bridge where it can be seen that the “people” are in motion. Another change was the lowering of the “control tower” making data more accessible by all LMIOP employees. The new model was video-recorded when each of the participating managers were explaining the meanings. In the attached link it is me explaining the aspiration model.

<https://www.youtube.com/watch?v=BtB9o-WNyb0>

I had experienced how the Russian employees had understood the idea behind the “virtual factory” when experiencing the interactive monitor and the virtual reality while “walking” inside the aspiration model. Therefore, it is extremely frustrating to me that we still do not have a full covering network of monitors, which is due to import restrictions in some of the countries involved.

The process renewal has been described and posted on LinkedIn by the facilitator (fig. 64) where the change of aspiration was discussed and commented on from external sources.



Marisa Matarese

Cultural Intelligence and Strategy, Change Management, Certified LEGO Serious Play f...

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Can you see the changes?

Together with a leadership team, we met a year ago to build the aspiration for a project organisation (to the left). Since we met, the team has done everything to make this aspiration come alive. Among other things, the aspiration model in LEGO has accompanied team members around the world. Both physically and virtually. It has made the foundation for an internal culture and language and has also had its passionate admirers.

However, after a year, it was time to make an honest status check about what had changed over the year - for good and for bad. It resulted in an aspiration version 2.0 (to the right).

My learning from today's workshop is, that even though it is essential to have a clear aspiration to guide us, it is crucial to take the changes into consideration and remember to adjust accordingly.



Figure 64 The facilitators posting on LinkedIn

As part of the research it also became clear that the internal explorative thinking was important in the process of learning from outside the organization. I have therefore decided to continue the educational journeys.

My latest action was a two day visit at Bosch in Mainz, Germany. The purpose was to discuss the use of “big data” in the context of Industry 4.0 and the interaction between human and machines with the purpose to enable organizational learning. The process was highly relevant to the further improvements of the interactive monitors. The inquiry process proved even better than at the earlier educational journeys and was very much directed towards Bosch’s capabilities in learning from their focus on gathering data. The visit did not create discussion on the differences between the industries but maintained a focus on what could be learned from outside inspiration.

I am currently feeling comfortable with the results already achieved and especially with the constant further development within the managerial team. However, same behaviour needs to be ingrained in the full organization. “We were blind – now we want to see!”

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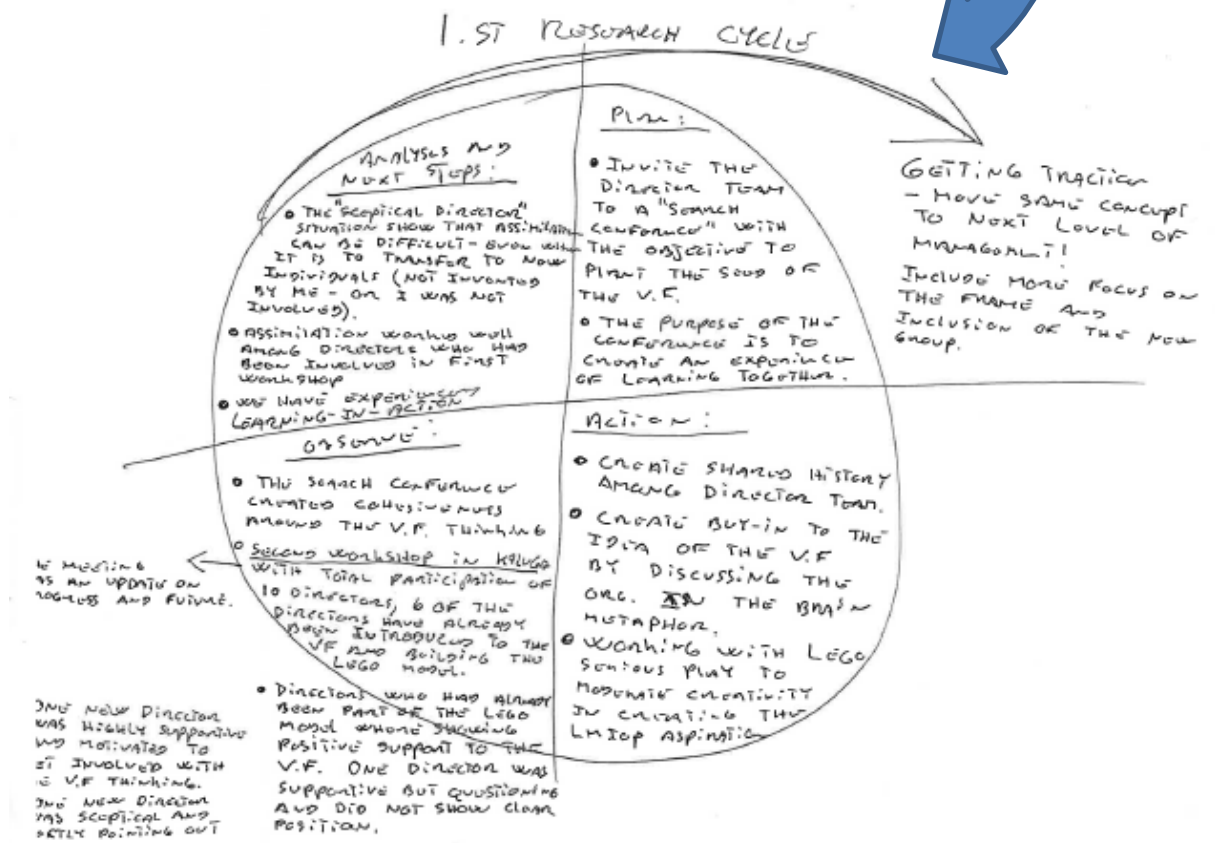
Appendices:

- Appendix 1: Raw data entries (example from first research cycle)
- Appendix 2: Pledge from Russia.

Appendix 1: Example of working with the “tools” and “raw data”:

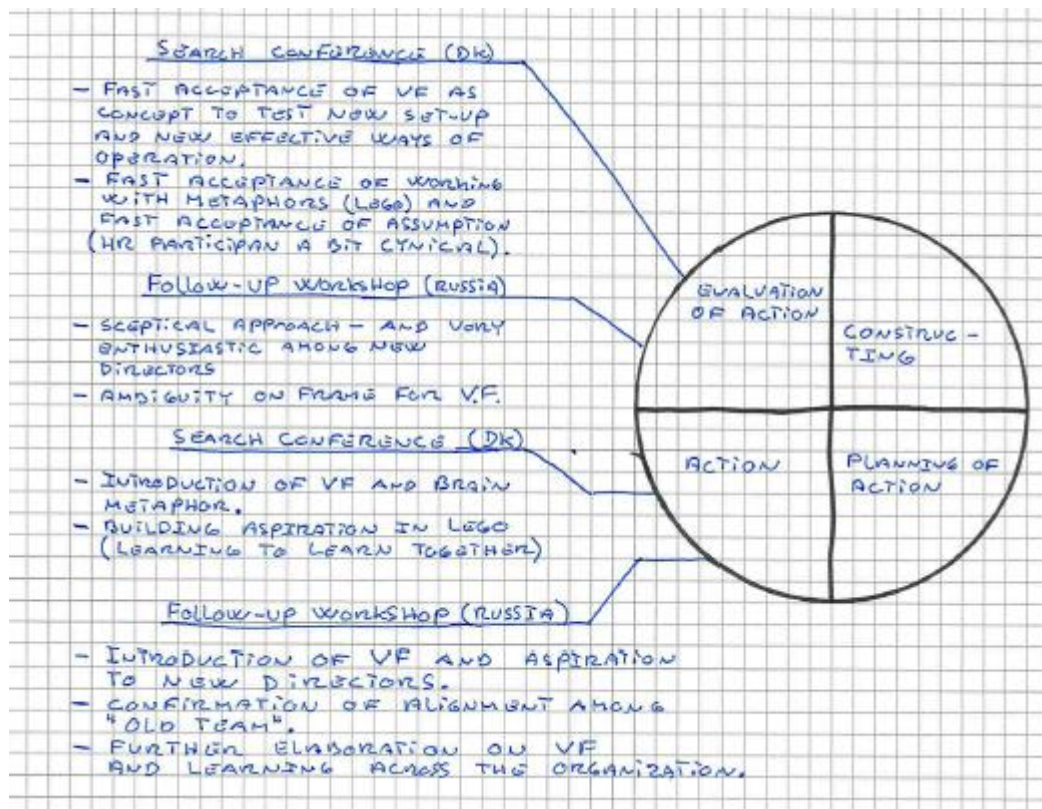
Raw data from research journal and notes are refined through the “processing tools” (first research cycle):

<p>Individual (Iran) who was sceptical was showing much interest in the frame for the future - needed much clarification of details.</p> <p>↳ THE POSITIONING OF THE FRAME AND OBJECTIVES SHOWS THAT FOR NEXT MEETING WE NEED TO BE MORE CLEAR ON DESCRIBING THE FUTURE IN SOME MORE CLEAR OBJECTIVES - ALSO ENSURE FOCUS ON SPECIALIST GROUPS AND THE FUTURE INVOLVEMENT OF “PROCESS GROUPS”.</p>	<p>□ ONE DIRECTION WAS NOT PARTICIPATING - BUT ONE FROM WHO WAS PART OF PREVIOUS LEGO WORKSHOP - BUT FOR ONE WHERE THE INVOLVEMENT OF NEXT LEVEL WILL BE IMPORTANT.</p> <p>□ REFLECTIONS FOR FURTHER ACTIONS:</p> <p>→ MORE FOCUS ON IRANIAN ORG. (ALSO SINCE DIRECTION WILL CHANGE WITHIN 2017)</p> <p>- GIVING TRACTION AND NEXT LEVEL IS IMPORTANT. (ENSURE FOCUS ON IRAN CONTINUATION IN OCT '17)</p> <p>→ MORE FOCUS ON WHY WE WANT A V.F. AND WHAT OBJECTIVES, DATE - NEXT WE</p>
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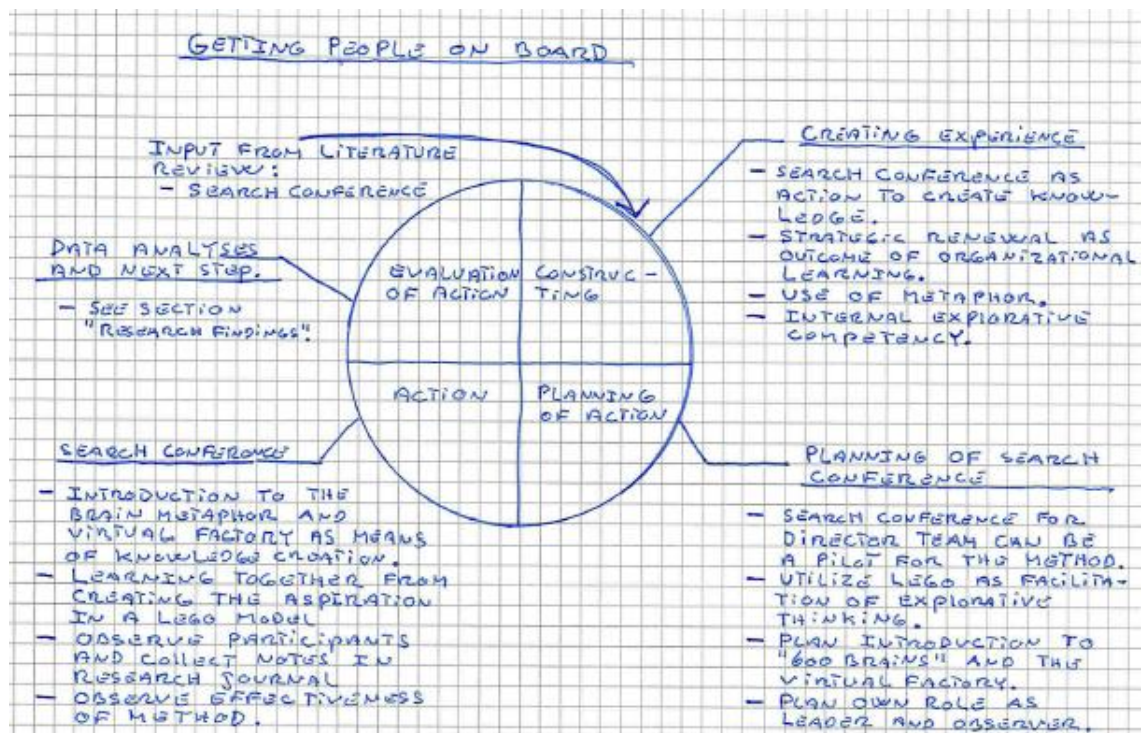


Rough data entries to the research cycle tool were done closely after the last data sampling. Moving data from the research journal and refining through iterations and sense-making. This process was to make a first sense of compiled data. The following sketch shows the further refinement of same data.

Step 2: Making order of first entry (what was done – and what happened).



Step 3: Overview of process before categorization for analyses.



The categorization can be seen in chapter 3, fig. 21.

Appendix 2: Pledge from Russian unit:

