CONTENTS

1. Introduction

This document is a part of a plan to start a collaborative process to develop a collaborative software-environment. The plan was written for a company now called the Company.

2. What is Collaborative Learning?
In this chapter, the concept of Collaborative Learning is looked at from many angles.

2.1. Examples of Collaborative Learning
The concept of Collaborative Learning is used in many contexts. Examples are:

- *Education*
  Collaborative Learning in Education refers to an *instruction* method in which students at various performance levels *work together* in small groups toward a *common goal*. The students are *responsible* for one another's learning *as well as their own*. Collaborative learning fosters the development of critical thinking through *dialogue*, *clarification* of ideas, and *evaluation* of others' ideas. For collaborative learning to be effective, the instructor must view teaching as a *process* of *developing* and enhancing students' *ability* to learn. The *instructor's role* is not to transmit information, but to serve as a *facilitator*.

- *Communities of Practice*
  Communities of Practice are *groups of people* who *share* information, insight, *experience*, and tools about an area of common interest. A community's focus could be on a professional discipline, a skill, a topic, an industry or a segment of a production process. They focus on *practical aspects of a practice*, everyday problems, new tools, developments in the field and things that *work and don't work*.

- *Evolutionary Development*
  The aim of Evolutionary Development (ED) is to deliver value to *all of the* participants (the stakeholders) within the *available budget* and the *agreed time frame*. ED is used when the environment is *instable* and/or there are *many different* participants (stakeholders) involved that have possible *conflicting* interests. The requirements are *discovered in an iterative process* by *evaluating* tangible results (prototypes). *Priorities* about the functionality of a prototype are decided by the *collective* (developers and stakeholders). A prototype is *extended* in a next iteration or completely rebuild. ED is a *group* activity. The project team focuses its energy towards success in the current step. They succeed or *fail together*. ED is about learning from hard *experience* what really *works,* and what really *delivers value*.

- *Action Research*
  Action research comprises a family of research methodologies, which aim to pursue *action and research* outcomes at the same time. There are four basic themes: i) *collaboration* through participation; ii) acquisition of knowledge; iii) social change; and iv) *empowerment* of participants. The process that the researcher uses to guide those involved can be seen as a *spiral* of action research *cycles* (iterations) consisting of phases of *planning, acting, observing and reflecting*. The underlying assumption is that effective social change depends on *the commitment and understanding* of those involved in the change process.

2.2. A High Level Model of Learning and Collaboration

The picture below describes a high level model of collaborative learning. The model contains many cycles. The main cycles are related to learning and collaboration. The other cycles *connect* the learning and collaboration-cycle.
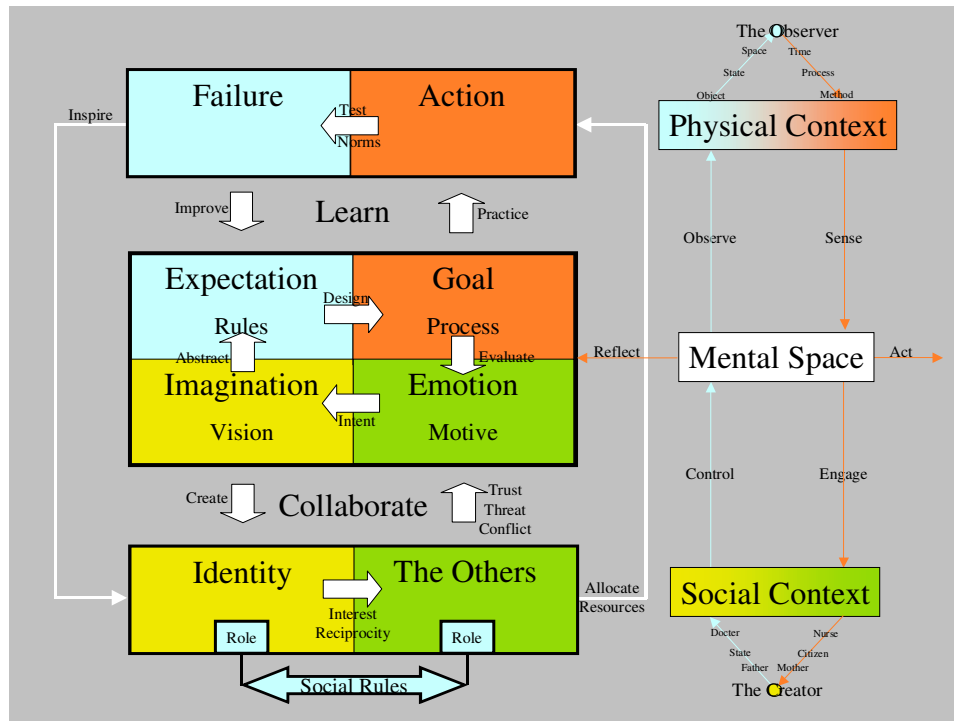
Collaboration and learning are active in their own space (the physical context and the social context) and join in mental space (the internal state of a person). A special part of mental space is the imagination. It creates the sense of a personal identity in the social context.

- *The Physical Context*

The physical context consists of public space and private space (in a home). This context contains things (objects, bodies, cars, tools, houses, books). Causal chains relate the objects. In the physical context a person is an object (being part of a causal chain) or an *observer (looking at* the context*).*

To the *observer* it *looks* like the physical context operates on its own. There is a limited amount of *personal control* possible. The physical world is the place where people learn because they *have to* react (to an event).

Virtual Space is growing part of the physical context. It is a space created by a simulator *(*e.g. *software).* At this moment, the Internet is the main provider of virtual spaces. Earlier examples of simulators are stories, plays, movies and books. Virtual space *simulates* the three other spaces. This simulation is not perfect. Many things are (at this moment)

impossible in Virtual Space (e.g. touching). Virtual Space makes it possible to *support* learning (e.g. Books, E-Learning) and collaboration (e.g. Communication, Groupware).

• *The Social Context*
People learn in a social context how to build up and sustain *long-term relationships*. It impossible to create anything without the help of others. Therefore people *need to* cooperate.

The social context (also called *culture*) is the world of *relationships,* collaboration and competition. People and things[1] in this world are *intentional (*purposeful*). A* person can *engage* (connect) itself in all kinds of stages with others in the social context. When people *connect* with other people they create *networks* (configurations). Human beings want to *control* or be controlled by the social context (dominance, submission).

In a social context, people can be seen as *actors*. They play *roles (*on a stage, observed by the audience*).* Their roles are described by *social rules (*script, scenario's, role-patterns*).* Relationships can be rewarding (creating self-esteem) or can deny the existence (the identity) of the actor.

• *Mental Space*
This world is the private inner space of a human being. This space is created by the *imagination*. It contains images, inner dialogues, feelings, moods, emotions and expectations. Mental space is related to the physical context by the *senses.* It is related to the social context by the *emotions (empathy).*

2.3. Learning
2.3.1. Introduction
Learning[2] is a process of *adaptation* to the inside (the body) or the outside environment of the learner. To adapt to the environment the learner has *to see a difference* (*focus*). This difference has to *motivate* the learner to perform a short-term (a *reflex, a reaction*) or a long-term action (a *plan*). A short-term action is controlled by the existing *action patterns (the behavior*). A long-term[3] action sometimes needs a *change of behavior*.

2.3.2. Learning by Acting
Most learning is based on *copying* the behavior of others (e.g. the parents in childhood). The copying behavior creates internal scripts (*action patterns, experience*). The patterns are changed when a person acts and an *expectation failure* is encountered[4]. To solve the failure a new action pattern has to be created. This pattern can be directly *copied* from an

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[1] In the social context everything is intentional. People are able to connect to other people, machines (a car, a motor), houses, forces (the weather), nature, work, hobby and animals.
[2] The most influential expert in Learning Theory at this moment is Roger Schank. See www.engines4ed.org
[3] Long term is here the opposite of short term (seconds). The main point is that it is possible to "think" before the act is performed.
[4] A failure can have to two effects: its a problem to be solved (a negative emotion) or an opportunity to be taken (a positive emotion).

expert (by observing), can be *shared* with an expert (by *storytelling*) or the new pattern can be created by *problem solving* (*exploring*).

It is possible to learn in mental space by *imagining* the physical context, the social context and even mental space. Mental Space is controlled by its owner (the consciousness and unconsciousness, the *will*). This will is resistant to change.

2.3.3. Abstraction and Reflection
In mental space the bodily action patterns can become *conscious*. If this happens, they are translated into internal images (by the *intuition*). The images become *mental models*. The concepts in the images are *named* (using words) and the relations between the concepts (verbs) become *definitions* of the concepts *(knowledge)*. In this way, they can be used for *reasoning*. Must concepts in the real world are fuzzy. They have many interpretations. In science, concepts have to be well defined to make effective reasoning (creating an "logical" expectation) possible[5].
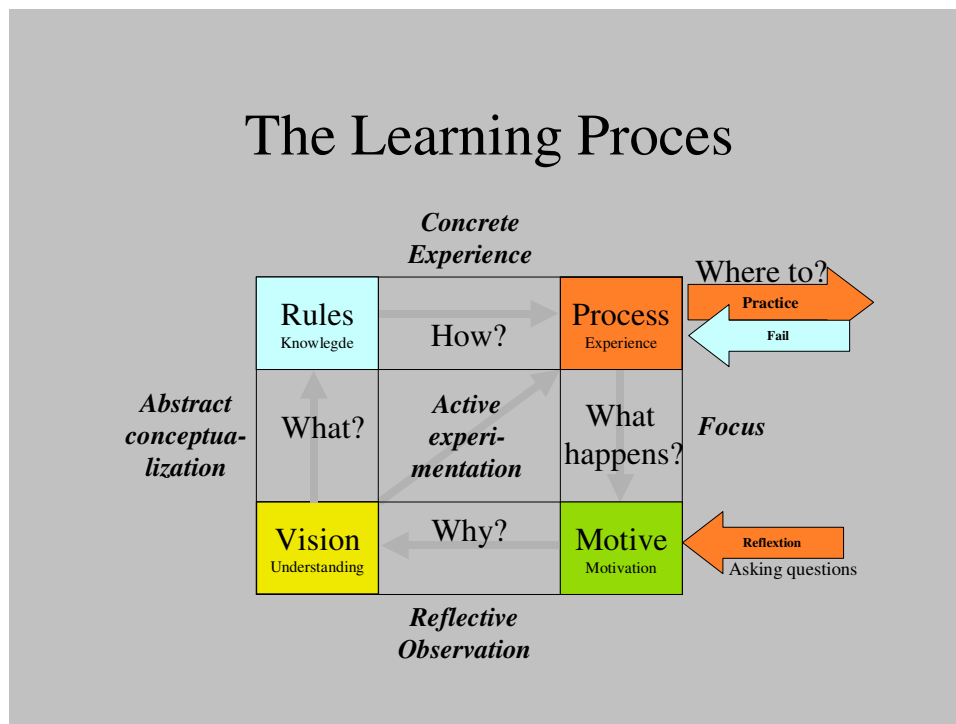
Reflection is a process that starts an internal query in mental space. The process is started by asking questions[6] (mostly *why, what & how*-question). The internal query reorders mental space. It creates connections between concepts, images and feelings that were until that time unrelated.

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[5] This is still not happening in the social sciences (and politics) creating and creates an enormous amount of confusion. The majority of articles that are produces by social scientists are about conflicts in definitions.
[6] This method is called Socratic learning

Abstraction (categorization) is a process that *observes* mental space and *compresses*[7] a set of concepts into *higher order* concepts. They make the world more simple (sometimes too simple).

2.3.4. Learning Styles
People develop preferences for different learning styles. There are a four learning styles[8]:
- *Reflective Observation (logs, journals, brainstorming).*
  The learner is mainly concerned with the why-question. They want to *understand* the problem and need time to reflect.
- *Abstract Conceptualization (lecture, papers, analogies).*
  The learner is mainly concerned with the what-question (*abstraction*). This is a learner that works on his own and uses theory readings.
- *Active Experimentation (simulations, case study).*
  The learner learns by exploring. The teacher should be a model of a professional, leaving the learner to determine her own criteria for relevance of materials.
- *Concrete Experience (laboratories, field work, observations).*
  The learner is mainly concerned with the how-question. He wants to apply what he learns in practice.

The last two learning styles participate easily in a collaborative learning approach. People with the first two learning styles are mostly working and learning *alone.* The can have an important contribution in a collaborative learning environment by *generating new ideas* or by *creating a model* that helps to understand the whole.

2.3.5. Educational Content
In most of the learning-processes the physical and the social context is *simulated* (abstracted) and therefore operates in virtual space. In virtual space the learner acquires *knowledge*. At a certain moment the learner has to move from virtual space to the physical or social context. He has to act. At that moment, the *real* learning-process takes place (acquiring *experience*, *internalization*).

Knowledge is *abstracted experience* (rules, concepts). If knowledge is valuated (in terms of money) it becomes *intellectual capital*[9]. If knowledge is transformed in virtual space it becomes *educational content*. Educational content is standardized by international standards (e.g. SCORM). The content is created by Learning Content Management Systems and can be used by Learning Management System. There is huge amount of standardized educational content available on the market. Most of the content is about abstract (generic) subjects (e.g. accounting, programming).

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[7] For more insight in this process see Fauconnier G., Turner M, (2002), The Way We Think: Conceptual Blending and the Mind's Hidden Complexities. Basic Books.

[8] Kolb. D. A., (1984), Experiential Learning: Experience as the source of learning and development, Prentice Hall PTR

[9] There are methods to determinated the value of the intellectual capital of a company. See G. Roos, J. Roos, Measuring Your Company's Intellectual Performance, Journal of Long Range Planning, Vol 30, No. 3, 1997

2.3.6. From Programming to Exploring
The current learning-process is a *top-down linear* process where the teacher *programs* (using a *curriculum*) the learner to become an *expert*. It takes a lot of time and money to create a curriculum and the educational content related to this curriculum. This is only possible if the environment is *stable*.

The main idea behind the current process is the concept of *a linear life cycle* where a person is trained at his youth, works when he is an adult and rests when he is old. The speed of change in the physical and social context is disturbing this concept. People have *to adapt* constantly to new external conditions (life long learning) and have to work, rest and learn in *shorter* cycles.

The educational system is incapable to adapt the curriculum and the teachers to the external changes. The system is *highly resistant to change*. It will stay in place for a long time producing experts that are not adequately prepared for their professional life.

The training of professionals is therefore taken over by companies or people *take care of* their own education. Companies and *self-guided learners* do not want to spend *too much time* transforming abstract knowledge into experience. The solution is to *incorporate learning in the work-processes* (*the practice*) itself.

2.4. Collaboration
2.4.1. Introduction
Collaboration is a process where a *group* of people (*a network)* works *together* to reach a *common* goal. There are two types of collaboration: *cooperation* and *alliance*. In an alliance the actors are independent but share a common goal. In cooperation the *goals and the resources* of the actors are shared.

2.4.2. The Value of Cooperation
Social capital theory looks at the *value* of collaboration. Collaboration accumulates *social capital*[10]. In contrary to competition, in collaboration, *the value of the connections* among individuals or groups of individuals is considered high.

This quality is measured in terms of:
- *Reciprocity*

Reciprocity, defined as the mutual or cooperative *interchange of favors or privileges*, is key to maintaining productive long-term relationships. When reciprocity is assured (based on *observed* behavior), individuals are more willing to help others, as they know they can expect the same in return ("returning the favor"). When reciprocity is

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[10] Social Capital Theory is at this moment the most influential sociological theory that tries to explain collaboration. See Robert D. Putnam, Bowling Alone: The Collapse and Revival of American Community by Robert D. Putnam (New York:Simon & Schuster, 2000). Second-generation social capital theories use game-theory, simulations and network-theory to explain collective behavior. A very important concept is the prisoner dilemma. See Robert M. Axelrod. The Evolution of Cooperation. Basic Books, 1984

transformed in the exchange of objective value (money), relationships can become short-term relationships (hit and run).

- *Trust*
  Trust comes in three forms:
  - *Thick*
  Thick trust is embedded in *personal relationships* that *are strong, frequent and nested* in wider networks (for example, you may trust your best friend with a loan).
  - *Thin*
  Thin trust rests on a background of *social norms* ("altruism") and *expectations* of reciprocity (for example, you stay late at work to reply to an urgent e-mail from a coworker).
  - *Transitive*
  Transitive trust extends a trust-relationship to a wider radius, by *bridging various thick trust relationships* (for example, if your best friend vouches for someone, you may lend them some money as well). Transitive trust is *how separate networks are interconnected o*r people *are integrated into* groups.

Humans learn social scripts (*role-patterns*) by the *sanctioning* (approval, disproval) of their parents when they are young. These scripts are internalized and control a major amount of the *emotions*. When people stay together for a long time, the social scripts that are shared become externalized and are transformed into *laws* (state and religion) and *social norms*. Socials norms are highly determinated by the *roles* people play in a profession (e.g. a doctor).

A network of cooperating (or competing) individuals needs *working rules*. Formal laws themselves are often major sources of working rules especially when backed with close *monitoring* and *sanctioning* by *public institutions*.

The difference between working rules and formal laws depends on the *contexts* in which the working rules operate and the extent that formal laws apply to those contexts. When people from *different professions, cultures and legal systems* work together, the collaborative environment has to provide working rules, laws and institutions of its own to cope with the diversity available.

No formal laws can completely cover the problems arising in daily life. However, when the mandates from relevant laws and official regulations are deemed impractical or improper, individuals have to create *their own working rules*. It must be possible to *revise, monitor en sanction* the rules without getting into a fatal conflict. Therefore, the collaborative network needs *a legal and authorities identity* of its own (a replacement for the mother of father in childhood).

In some cases, (a company, a project or a learning environment) this authority (manager, project-manager, teacher) is already available. When it comes to social actions, the creation of a formal power can become the cause of the end of the collective process.

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2.4.3. Control and Engagement

Interpersonal theory[11] looks at the world from the perspective of *relationships*. According to attachment theorists, the infant's attachment system keeps the child close and *connected* to the adult, thereby increasing the child's chances of surviving infancy. As children come to *feel sufficiently secure in their attachment* to the caretaker, they separate from the caretaker and explore the environment, a first step toward autonomy. People are able to connect with others if they are working in *a secure environment (*simulating the parent*).*

When a person initiates an interaction with another person, the other *assumes that the behavior is motivated (purposeful)*. When an important goal is satisfied, the person experiences a positive emotion; when it is frustrated, the person experiences a negative emotion like sadness or anger.

Internal motivations can be *conflicting.* This can result in serious mental disorders.

The interpretation of the motivation of the other is often ambiguous leading to misunderstanding and even conflict. To resolve these potential conflicts an *open dialogue* is necessary where people make their motives clear to others (and themselves).

Motivational constructs (desire, motive and personal striving) can be conceptualized in two very broad, abstract categories, namely, e*ngagement* and *control.* An engagement is a motive for *a connection with one or more others*; it is a motive to participate in a larger union with other people. An engagement can range from indifferent (no connection) to love (a complete connection).

Control emphasizes *the self* as a distinct unit; it focuses on the person's own individual *influence, control, or mastery* over the self, other people, and the environment. Control can range from dominating to submitting.

Interpersonal behavior can be described with the so-called *interpersonal circumplex*. This is a widely tested model that predicts the reaction of a person to a motive (a combination of control and engagement) of the other.

The motivational behavior of a person is more or less determined in his youth. People that are *extreme in the engagement/control-matrix* (e.g. indifferent to the other, too dependent, very dominant or submissive) are unable to work in a collaborative manner.

2.4.4. Purposeful Systems

Systems theory[12] looks at the world from a *control* perspective. Systems theory evolved from the analysis and prediction of the behavior of *mechanical systems* (machines) and one-mind systems (hierarchies) to *multi-mind-systems* (*networks*).

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[11] See Horowitz, L. M. (2004). Interpersonal foundations of psychopathology. Washington, DC: American Psychological Association.

[12] See Charajedach, J. (1999), Systems Thinking, Butterworth Heinemann.

Multi-minded systems are a voluntary association of purposeful members who themselves manifest a *choice* of both ends and means. Mechanical or biological models cannot explain behavior of a system whose parts display a choice.

A purposeful system is *part of a larger purposeful whole*. At the same time, it has purposeful individuals as its own members. *Aligning the interest of the purposeful parts* with each other and that of the whole *is the main challenge* of the system.

The elements of multi-minded systems are *information-bonded*. Riding a horse (in the physical context) is an example. Horse and driver have *complementary skills* (moving and guiding) and *share experience*. It matters to the horse *who* the rider is and it matters to the rider *what horse* he is riding. A proper ride can be achieved only *after a series of information exchanges* between the horse and the rider. Horse and rider form an information-bonded system, in which *guidance and control* are achieved by an *agreement* that is *renewed* every time the *goal changes. The agreement is* based on a common *perception* (sensing at the physical context) and preceded by *a psychological contract (*control and engagement in the social context*).*

The members of a network are held together by one or more *common goals* and *collectively* acceptable *ways* of pursuing them (a *community of practice*). The members share *values* that are embedded in their *culture.* The culture is the cement that integrates the parts into a cohesive whole. Nevertheless, since the parts have a lot to say about the organization of the whole, *consensus* is essential to the alignment of a multi-minded system. To enforce consensus *an authoritive institution* that resolves *conflicts* is needed.

Important concepts in purposeful systems theory are:
- *Emergent Behavior*
  In a mechanical system the parts determinate the behavior of the whole. In a one-minded system (a corporation), the control-center (the operating system) coordinates determinates the behavior of the parts with mostly hierarchical power. The relationships between the parts are mainly fixed by organizational structures. In a purposeful system the parts are much smaller. The parts are individuals or small groups of individuals that *can be easily connected and disconnected*. The behavior of the whole is now related to a *possible* interaction-pattern of the parts (a *configuration*). Changing the relationships between *a few parts* (e.g. rearranging certain relationships between people and/or tools, one person leaving a company) can change the behavior of the *whole dramatically*.
- *Multi-Dimensionality*
  Concepts are in the old systems-paradigm described as a *dichotomy*. They exclude each other. In a dichotomy a rational choice is possible (A *or* B). In a purposeful environment concepts are often *complementary, related and circular (extremes meet in the same point).* A combination of N complementary concepts generates a N-dimensional dependency-matrix in which the relationships are *not linear* (there are often based on a *power- or scale free distribution*). In terms of collaboration not only the win-lose-relation exists (competition) but also lose-lose and win-win are possible outcomes of a process.

- *Counter-intuitiveness*
  In a purposeful environment, actions intended to produce a certain outcome can generate the *opposite* result. The main reason is that cause and effect relations are not linear chains. Events can start *multiple* chains. Chains can be *circular* and effects can be *delayed*. The best way to describe the behavior of a purposeful system is *chaos-theory (fatal attractors)*.
- *Phase Changes*
  A quantitative change, beyond a critical point, results in a qualitative change (a new structure). The system jumps to a new state-space. Just before the change occurs the system shows chaotic behavior and is not controllable. System can stay in an old state for a long time (meta stable behavior). Moving forward or moving back during a state-change creates different results. In a state-change it is sometime necessary to start al over again because the rules of the old situation are not applicable anymore.
- *Purposefull wholes (not parts) resist change*
  Purposefull wholes (e.g. cultures, technologies) stabilize in time. At that moment they resist change. The social norms and the community of practice act as a filter (a boundary) for the parts (new tools, new people) to get in or stay in the system. People that are fond of structures (crafstman) stay. People that like change (innovators) leave. The whole is determinated to die in due time.

2.4.5. Communication
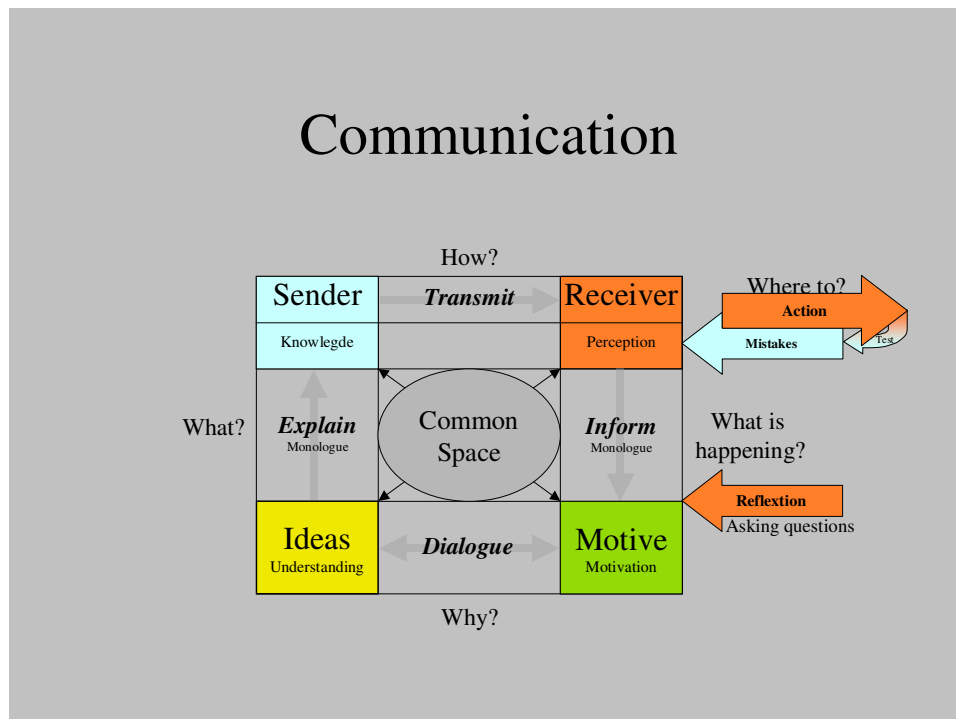
To collaborate people have to communicate. The most used model in communication is the sender/receiver-model. People send and receive knowlegde (e.g. content, email, documents. The sender/receiver-model supposes that the brain converts ideas directly into words and that another person can easily draw out the meaning of the ideas from the words. It assumes little effort to understand or interpret what is being conveyed. The sender/receiver-model only works if there is common space (similar motives, ideas, knowledge and perception) that is shared by the people involved in the collaboration process.

In reality, this is mostly not the case especially when experts are communicating with laymen. The dialogue between an expert and a layman is often a monologue. The expert has inform the layman about what is happening, he has to explain his ideas. Thet layman has to find the right questions to get a proper understanding. If people are similar it is possible to have a dialogue.

If people are too different, they have to invest time to understand (ask unsophisticated questions) and explain their ideas (inventions) in many ways. It also takes time to generate trust. Ideas of others have to be tried out (in the imagination or in the real world) to understand them. People have to have the opportunity to fail and learn from their own mistakes. Sometimes they generate personal inventions that can be given back to the others to create reciprocity. Eventually ideas create new personal patterns that can be shown and praised by others. Collaboration does not take place instantly but evolves in a cycle where the pleasure of finding things out is the motivator.

2.5. Conclusion

In the previous chapters collaborative learning is looked at from very different angels. The model in Chapter 2.2 is hopefully explained and validated. In this chapter a few conclusions are formulated that can be used as a guideline in the next steps.

2.5.1. Short Term Cycles

The physical and the social context are changing fast. To accomodate the vast amount of changes a highly adaptable (goal seeking)[13] structure is needed. One of the basic concepts behind collaborative learning is short term cycles (or iterations). In the model in chapter 2.2. we can see many cycles and to make it very clear not all the possible cycles or shown. The current model identifies 24 steps (4X3X2) that can be connected. They make a infinite amount of paths of change possible.

2.5.2. Decision Support

Every time when a step is realized the environment has to be sensed and a proper diagnosis determinates the next step. To do this an advanced system of monitoring is needed.

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[13] The process is more important than the stucture.

2.5.3. Conflict Management

Moving from one step to another step generates a *possible* conflict. These conflicts can be resolved by making use of *people* that are more or less *born to solve* the conflict. The main resistance to change comes out of the *community of practice*. Steps like abstraction (changing a the process-model of the working processes) or allocating resources (changing priorities in the working process) are not liked.

2.5.4. Action Orientation

It is possible to cycle in the model for a long time without getting in to action. This possibility has be prevented by moving fast into the social or physical context. Gaining experience by failing has to get a top priority.

2.5.5. Tools

Every step or combination of steps can be supported in virtual space. It is often the case that physical context (abstraction) dominates the social context. Therefore the involvement of the users of the tools is nessecary to make sure that the tools are usable and are an improvement to the working processes.

### 2.5.6. Focus on community of practice

In Chapter 2.1. the most interesting example of collaborative learning is the community of practice. Behind the idea of the community of practice is the concept of apprenticeship. The practice has to be acquired (a learning environment for students) and changed (evolutionary design). A vast and usefull literature on the subject of communities of practise is emerging. My advice is to focus the development effort on supporting communities of practice.

2.5.7. What is the next step?

The next step is to start an colloboritive learning process to develop a collaborative learning environment. The next chapter chapter contains a proposal how to start this process.

3. The Development Process

The development process of the collaborative learning environment is a collaborative learning-process of its own. In this chapter, the major steps in the process are described. The model in chapter 2.2 is used. To create a collaborative process *more than one* person has to be involved.
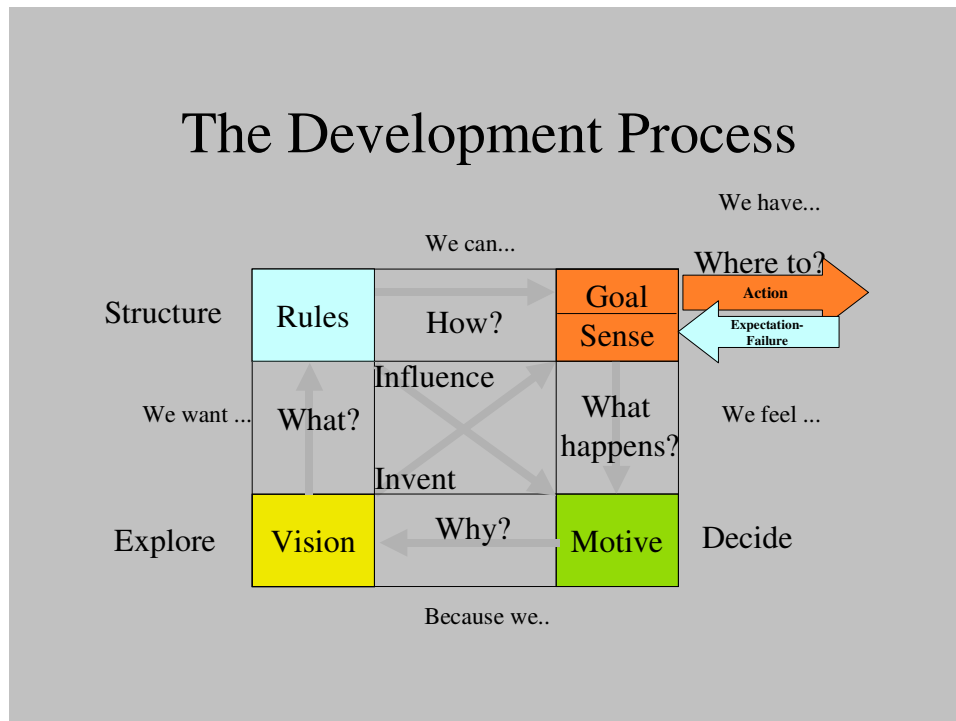
3.1. Define the Context (The Marketplace)

The first step is to define the social and physical context (*the marketplace*) we want to look at. My proposal is to take the Company and its environment as the main context.

3.2. Evaluate: *What is happening in the marketplace?*

In this step, we have to look at the context and find out what is happening in the domain of (collaborative) learning. This step is a collective step. The major stakeholders have to be involved. A workshop or a brainstorm-session is the best approach. The outcome of this step has to be a clear understanding of the issue and a shared motive (values and direction) to get into action. To give input to a workshop a list of possible expectation-failures and a simple analysis (the main causes behind it all) is provided in this chapter.

3.2.1. What are the expectation-failures The Company is experiencing?

The Company is a collaborative operation situated in many countries (and cultures) and is providing a solution to support collaboration (of software-components and people).

The main problems, related to learning and collaboration, that The Company is experiencing are:
- *Insufficient internal and external knowledge transfer*
- *Complex coordination between different internal (e.g. India, The Netherlands) and external producers.*
- *Complex coordination between internal and external projects*
- *Involving the customer in the development process*
- *Explaining the product and the service*
- *Defining a long term strategy*
- *Positioning the product*
- *Creating a network (of practice)*
- *Unable to define the right components*
- *Responsibilities marketing and R&D*

3.2.2 Analysis

For a long time people believed that, the world had entered a period of sustained growth (the long boom) that could eventually double the world's economy every dozen years. New waves of technology would lead to big productivity increases that would cause high economic growth.

The long boom assumed an evolutionary process where governments, companies and consumers could easily absorb new waves of technologies. In practice, new technologies act as a shockwave. Every time when companies become aware of the shockwave (a hype), they react quickly. The wave acts as a threat (the competition will beat us if we don't act) and at the same time as an attractor (it will generate high benefits for us if we win). Therefore, everybody starts to experiment, sometimes on a very large scale. After a long time best practices emerge and the new technology is absorbed. At that moment it becomes often clear that the technology has a completely different effect than everybody thought it would have. Most of the time there are many losers and a few winners.

Not many technologies keep their promise (e.g. Client/Server, E-Commerce). The frequency of shockwaves is much higher than the absorption time of the new technology. The effect is that companies are in many stages of adoption at the same time. More and more managers are very skeptic and hesitant to start a new absorption wave. They are left with many layers of software. Some of the software-layers are so old that almost nobody knows what is does or how to get rid of it. Most of the companies first want to clean the mess of all the waves that hit their company before they start with something new. The big problem is that the software-industry never stops to launch new shockwaves and nobody knows for sure if the new wave (perhaps for the first time) will keep its promise or his threat.

Behind the scene, something else is happening. Western culture is encountering a paradigm shift. Slowly the era of rationalism is ending. The rationalists were obsessed by objectivity and perfection. In their view, objectivity and perfection can only be accomplished by controlling the subjective parts, the emotions (detracting the brain) and the imagination (creating illusions) by the logical reasoning of the intelligent calculating

machine, the brain. The rationalists created the big corporations (with the brain at the top), the general-purpose computer (with the brain in the operating system) and the standardized mass production systems that eliminated the craftsman and replaced him with the perfect objective human, the robot. The brain is not capable to understand the effects of his interventions in nature and society anymore. His aim to control has the opposite effect. Nature and society are complex systems with many unknown short-term and long-term feedback loops.

The new paradigm takes its metaphors out of biology. The world consists of numerous networks of cooperating and competing human agents. A network is uniquely determined by its human- and technology-patterns. These patterns act as an imaginary boundary. They shield the network from changes in the environment. New participants have to learn to use the technology and the internal procedures to survive in the network. The behavior of the human participants in a network changes slowly. When they do not like the network, they move to another. Human members come and go but the technology-patterns of the network stay alive.

On a high level, we can see that the opening of a new space of possibilities causes the movement of all the networks. When one of the networks moves into the new space, others have to follow in due time. The movement of a network can be slowed down by physical boundaries (islands, mountains), physical space itself (traveling) and cultural boundaries (languages).

The invention of symbols opened up mental space. It caused a major change in human society by enabling the creation of writing, mathematics and the development of the automatic calculator, the Computer. The Internet is opening a vast new space (Cyberspace) of new opportunities on two levels. It makes new technology-patterns possible and it facilitates the bridging of human networks (communication). The last factor will speed up of the movement of networks heavily. New networks and new patterns of behavior (products, services, cultures) will arise (and fade away) that nobody has ever imagined.

The Internet is enabling a level of collaborative creativity that was not possible before. The corporations try to manage the collaborative creativity by giving the customer a choice (mass customization), speeding up the product development processes by introducing advanced systems of product life cycle management and involve the customer in de product-design (customer-innovation). Outside the corporations, consumers and small flexible specialized companies merge spontaneously into networks that produce unique products that carry the signature of the craftsman again. In the future big corporations, consumers and small-scale businesses will merge and create a completely new business-ecology.

The Internet and its new general purpose technology-patterns will make it possible to move down to the human scale of cooperation, the network. By connecting the networks, the world will move up to a level of collaboration that was never possible before in history.

3.3. Intent: Why do we want to create the new environment?
3.4. Abstract: What do we want to create?
3.5. Design: How do we want to create the new environment?

4. Collaboration

4.1. Create: What Roles and Role-patterns will we use?
4.2. Interest: How do we involve other people?
4.3. Allocate: What resources can we use?

5. Action