Lean Information Management

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The concept of a Lean Enterprise has proven to be extremely valuable for making companies fit for today's competitive business environment. Lean Information Management denotes the type of information management that is appropriate for such an organization. According to the paradigm of a Lean Enterprise, it is based on an integral view on people and organizations. It is thus much broader than most contemporary concepts that concentrate on data and information technology. Based on an organization-oriented definition of different types of information and the essential concepts of a Lean Enterprise, this paper develops a number of practical information management rules.

Keywords: Information Types, Information Management, Lean Enterprise, Effective Use of Information and Information Technology.

1. Introduction

We live in an information and knowledge driven society (Cash et al., 1994) where information has become the fifth production factor after people, material, energy and capital. Knowledge, in this context, is defined as information that helps in performing a particular task. In this paper, no distinction is made between information in general, and knowledge in particular.

An essential driving force was, and still is, the possibility of *efficient* information processing (from section 2, it will become clear that this holds only for one subtype of information, data) provided by modern Information Technology (IT). By IT, we mean all types of computerized equipment like computers, communication networks, user interfaces, process interface equipment, etc.

Unfortunately, our ability to handle information *effectively* is only developed to a much lesser extent. Efficiency, in this context, denotes the fitness for a particular purpose, while effectiveness denotes the ability to support a multitude of related tasks. Efficiency is a measurable quantity, while effectivity has a qualitative character.

Given the enormous hidden costs that occur at all levels of an organization if information and IT is not used appropriately, it is amazing that we still concentrate on technology.

Business Process Reengineering [(Hammer et al., 1993) and Davenport, 1993)] was the first step in the right direction. In contrast to the classical automation of existent business processes to increase their efficiency, Business Process Reengineering showed how IT could be used to reengineer business processes radically in order to achieve business breakthroughs in terms of strategic advantages, customer values and process performance. Nevertheless, Business Process Reengineering still concentrates on technology too, and has a number of shortcomings. First, organizational issues are only considered to the extent to which they hinder a reengineering project (e.g. the resistance against change and the resulting demotivation). Second, only the enabling factors of IT are considered, while the use of IT (like the use of any other technology), on the long term, also has a number of disadvantages. Third, Business Process Reengineering does not pay explicit attention to information management.

In our opinion, these three problems are responsible for the failures of many Business Process Reengineering projects and for the missing correlation between IT-investments and business performance (Strassmann, 1990). Consequently, the disabling factors of IT are also considered in (Hammer, 1991) and (Hammer, 1992a). In this way, the disadvantages of IT

can be compensated by appropriate organizational measures.

Similarly to the two papers mentioned above, this paper also considers the use of information and IT in an organizational context. In general, it addresses what we believe to be the real reason for the ineffectiveness of present information management methods [an overview of the state of the art can e.g. be found in (Schmidt, 1996) and (Krcmar, 1997)], i.e. the unconscious way in which we still deal with information and IT. On a more operational level, it addresses the following three problems: (1) clear concepts about what information really is and how it should be handled accordingly are still lacking because we have difficulties to distinguish between different types of information; (2) up to now, information management has concentrated too much on the data, neglecting other types of information; and (3) integral concepts for the management of information are missing because we still concentrate too much on the technical aspects and neglect the many organizational issues involved.

In order to tackle the first two problems, an organization-oriented view on information that allows the distinction of different types of information is introduced in section 2. To facilitate the discussion of the third problem, section 3 introduces the Lean Enterprise concept as an integral and holistic organization concept. This allows the formulation of the basic laws of Lean Information Management in section 4. Finally, in section 5, the essential rules of Lean Information Management are summarized.

2. An extended view on information

As explained below, information is only meaningful if it relates to a particular organizational context, e.g. if it helps people to solve a problem or to make a decision. Since information management always operates in an organizational context, information should be considered in the context of an organization model. For the purpose of our discussion, we chose the integral organization model described in (Glasl et al., 1993) because it is quite complete and describes all aspects of an organization.

2.1. An organization model

The organization model of Glasl and Lievegoed is shown in figure 1. It distinguishes seven aspects of an organization, grouped into three subsystems:

1. The *technical-instrumental subsystem* describes the "physical" aspects of an organization. Since these aspects are the most tangible and visible ones, they often get more attention and are better equipped with methods and tools than the higher-level ones. Traditional tayloristic organizations are organized according to the metaphor of a mechanical machine and emphasize the technical-instrumental subsystem. The technical-instrumental subsystem is anchored in the past because it is the result of activi that were performed in the past.

- The physical *means* consists of the basic production factors (material, energy, capital and data) including the technical infrastructure (buildings, machines, transport systems, computer networks, etc.). It describes the physical aspects of an organization and can be characterized as the "organization on Sunday". It answers the question "what are our resources"?

- The *process* aspect subsumes all primary (production), secondary (supporting) and tertiary (management) processes, including the related information, decisions and control processes. It describes the "metabolic" aspects of an organization and can be characterized as the "organization in motion". The process-orientation of a Lean Enterprise (see section 3, point 1) stresses the importance of the core business processes of an organization. The process aspect answers the question "how are our flows organized"?

2. The *social subsystem* covers the social interaction of people via functions and organizational structures. It is the linking entity between the technical-instrumental and the cultural subsystem and it governs the daily (here and now) behavior of an organization.

- The *functions & agencies* aspect describes the tasks, competencies and responsibilities of individual people, departments and agencies. It answers the question "what are our tasks and responsibilities"?

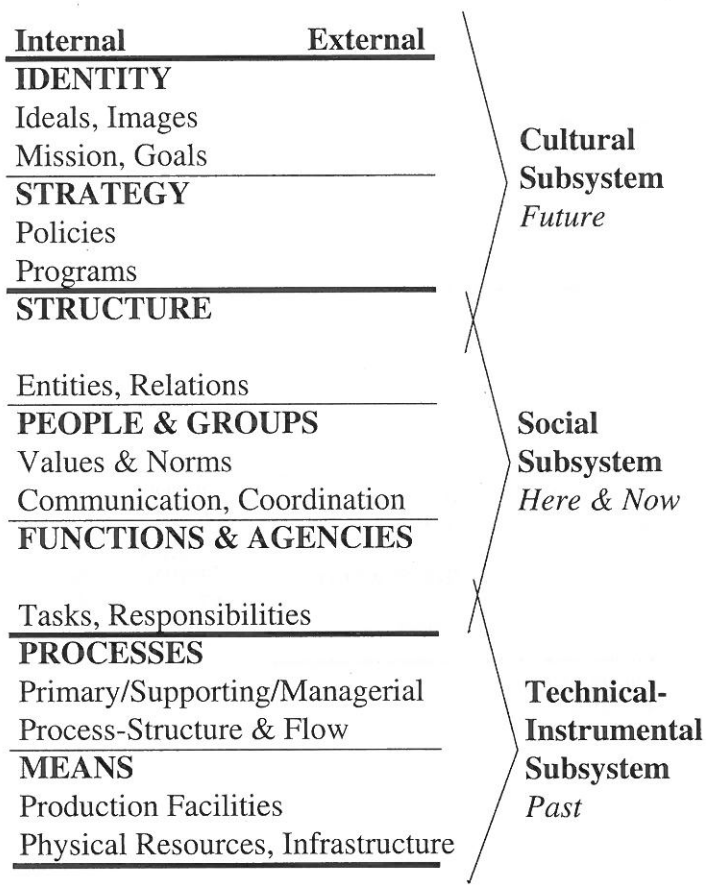

Fig. 1. The seven aspects of an Organization.

- The *people & groups* aspect comprises all socially relevant human factors like skills, attitudes, social relationships, values and norms, management styles, social roles and political power. The sum of these factors is often referred to as the "working climate" of an organization. It answers the question "how do we behave and interact"?
- The *structure* describes the formal structure of an enterprise in terms of functional hierarchy, project organizations and external relations. It answers the question "how are we organized"?

3. The *cultural subsystem* describes the "personality" of an organization. It provides (1) purpose and identification; gives (2) orientation towards the future and governs the development of an enterprise; and is (3) important for the coherence of a process-chain (see section 3, point 3b). It is therefore a prerequisite for continuity. Nevertheless, the cultural subsystem is often underdeveloped because of its invisibility and the unconscious way people often deal with it.

- The *strategy* aspect describes long-term concepts, policies, programs and plans that are necessary to reach the goals defined by the identity. It answers the question "how do we realize our identity"?
- Finally, the *identity* subsumes the ideals, the images, the mission and the goals of an enterprise. It answers the question "who do we want to be and where do we want to go"?

It is important to note that the seven aspects of an organization cannot be simply interpreted as a layer model or a hierarchical structure. The model is human-centered and all seven aspects are present at any level of an organization, from the individual employee, via various organization units, to the top management. However, the cultural subsystem is more important at the management level and the technical-

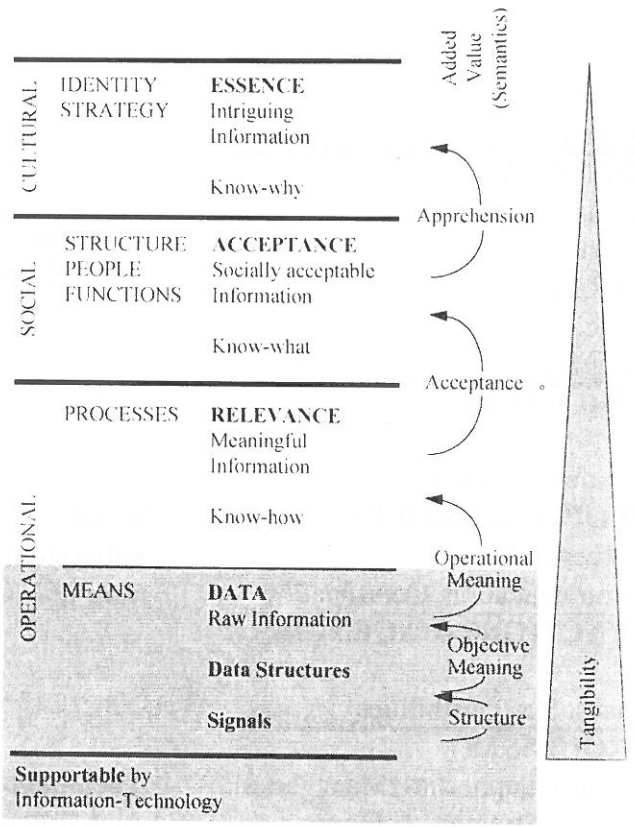

Fig. 2. The four Types of Information.

instrumental subsystem is most obvious at the work floor. In addition, the different aspects vary per organization entity, especially in large organizations.

2.2 An information model

Based on the organization model described in the previous subsection, we can now try to identify which type of information can support a particular organization aspect. This distinction between different types of information is important for the development of clear concepts about the use of information and IT. Any attempt to define information management rules without a detailed concept of information is doomed to fail, similar to any attempt to design a traffic management system without the possibility of distinguishing between different types of vehicles. Unfortunately, most contemporary definitions of information are not very helpful because they are either quite philosophical [see e.g. (Winograd et al., 1988)] or restricted to the technical-instrumental subsystem [see e.g. (Gibson et al., 1987) and (Liebenau et al., 1990)].

In the subsequent discussion, we use information as a generic term. We make a distinction between information and its carrier: e.g. between the information provided by a book and the paper it is printed on or between the information stored in a computer and the magnetic storage medium. Our discussion is, however, independent from the type of the information carrier and only concerned about the different meanings of information.

In the left part of figure 2, the different aspects of an organization are shown. In the middle, the corresponding information types are mentioned. Finally, the right part of figure 2 indicates the "value" or meaning that has to be added in order to transform a lower-level and more general type of information into a higher-level and more specialized one. This transformation of information also provides a powerful filter mechanism. There are lots of data, but only few of

them are relevant in a particular context; only a small amount of the relevant information is appropriate in a particular social context; and of the appropriate information a still smaller part "triggers" new insights or actions in people. A detailed treatment of information filters and their use to fight the "information flood" are, however, out of the scope of this paper.

According to the visibility of different aspects of an organization, the information at the level of the technical-instrumental subsystem is the most tangible one, while the information at the level of the cultural subsystem is the most intangible one. The information itself is already a concept. Being physical machines, computers can only handle data.

In correspondence with the description of the organization model in subsection 2.1, we start with the most tangible and best-understood types of information:

1. At the level of the technical-instrumental subsystem, we distinguish two types of information according to the two organization aspects, data and relevance:

- *Data* can be considered as the raw material of information and can be considered as a means aspect of an organization. They are constructed by clustering signals (e.g. black-white contrasts on paper, electronic signals or acoustic signals) into data structures (e.g. letters and words of our natural language or bytes and records of a computer language) and giving these data structures an "objective meaning" (e.g. the semantics of a word in a particular natural language or the semantics of a particular integer as is the sum of an invoice including VAT). Note that clustering of signals is a syntactic operation.
- *Relevance* are data that are meaningful for a particular process, i.e. either derived from this process or necessary to control it. If relevance is used by people in order to perform a particular task, we also speak about the know-how. Note that what we define as relevance, is by many people called "information".

2. At the level of the social subsystem, we distinguish only one type of information, *acceptance*. This is because structure and function do not matter here, but only people do. The issue is, whether the information is in a form that is acceptable in a particular social context. According to the "unwritten rules" of an organization (i.e. the values and norms), information must often be "packaged" in a particular form and adequately timed. Although this is often annoying and troublesome, it is important to "get things done".

3. At the level of the cultural subsystem, only one type of information is considered, *essence*. In this case, the reason is that this subsystem is not as explicit as the technical-instrumental one and a further subdivision is not meaningful. The issue now is, whether information is intriguing enough to bring people into motion: either inwards by generating new intriguing insights, ideas or decisions or outwards by "coming into action". After all, this is the only thing that counts; otherwise information ot reached its purpose.

Similar to the time-orientation of the different subsystems of an organization described in subsection 2.1, data and relevance always represent a past state, acceptance refers to the here and now, and essence has a strongly future-oriented character.

An interesting question now is how one can arrive at the "essence" of information?

- First of all, information must be *goal-oriented* at the level of the technical-instrumental subsystem, i.e. related to the business process under consideration.

  Although this is probably the most trivial condition, it is also the most violated one because the goals of gathering, handling and transforming information are often not made explicit. In addition, information is not a scarce resource like the other production factors: myriad things can be measured in order to get data and there are numerous ways to combine data into new data. Without clear goals, one is literally lost in a flood of data that have no added value and who's handling only generates overhead. To make things even worse, this overhead is usually hidden and only indirectly visible by the bad performance of the affected processes.

- Second, the data must be transformed into a human-oriented form at the level of the social subsystem.
  This can be done, for example, by clustering

(aggregating) it, by representing it in a context (e.g. by putting it into graphical form and representing it as a trend).

- Next, a *living image* of a situation has to be built-up.
  It is a misconception that we "understand" situations or are able to make decisions by rational analysis only. For instance, scientific management, that has meanwhile proven to be ineffective, was based on this idea. Of course, we need to analyze a new situation. But based on this analysis we also need to synthesize the facts into an inner image of the situation. While analysis and the drawing of logical conclusions are activities of the left part of our brain, imagination, clearly, is right-hemispherical. Since computers are logical-analytical machines (the discussion whether our brain is more than a simple computer is beyond the scope of this paper), this implies that humans must combine of "acceptance" into an image.
  By "living image", we mean an image that is not simply a one-dimensional abstraction, but the one that was constructed by considering the situation from different aspects, and therefore relevant for similar situations and future-oriented. A good example is the 7-aspect model of an organization described in subsection 2.1. "The organization as hierarchy" or "the organization as machine" would be one-sided abstractions of the reality that neglect most of the aforementioned aspects of an organization.

- Finally, the "essence" of the inner image of a situation must be extracted at the level of the cultural subsystem.
  This is the answer to the question "what does this image tell me and what do I consequently need to do"?

Although not all aspects of our information model can be discussed here [for more details see (Hammer, 1992c)], two things should be clear from this discussion: (1) the essence of information is situational; and (2) there is usually too much data and too little essence.

3. Lean Enterprise

The paradigm of a Lean Enterprise, as described in (Womack et al., 1990, 1994 and 1996), is not only important because of the efficiency increase (up to a factor 2 to 1), but also for the flexibility it provides compared to more traditional ways of running an organization. This dramatic performance increase is the result of the underlying holistic concept that integrates the different aspects of an organization and which results in a completely new way of organizing the working relations among people.

Although this paradigm was initially developed for the automotive industry (Toyota), it has meanwhile been shown that it can be applied to all types of enterprises, including service organizations [(Biehal, 1993), (Bösenberg et al., 1993), (Groth et al., 1994), (Glasl et al., 1994) and (Womack et al., 1996)]. In order to become effective, it requires, however, a completely new way of thinking, characterized by the following five principles:

1. Orientation at the core business processes.

The aim of the whole organization is the optimization of the added-value for the customer. This is only possible if an integrated view on the process-chain (including the internal and external customers and suppliers) is maintained and if it results in the following rules:

a. The enterprise is organized around the core business processes and not around functional departments. The latter act as resource units with the responsibility to improve the know-how and skills of the people working in a given discipline.
   Business Process Reengineering projects might help to make the business processes lean and targeted towards the customer. On the long term, they will, however, be successful only if they are based on integral principles that consider not only the IT-issues, but also the organizational ones.

b. A process manager is responsible for every core business process, including the coordination of various functional departments.

c. The supporting processes (secondary processes) and management processes (tertiary processes) are subordinate to and derived from the core business processes (primary

processes).
Together with the second principle of a Lean Enterprise (customer-orientation), this ensures a flat and flexible organization structure.

d. The activities of a process-chain are triggered by the customer.

e. Continuous process improvement (Kaizen), including benchmarking.

f. Responsible use of resources.

2. Customer-orientation.

All activities of a Lean Enterprise are aimed at and driven by the internal or external customer, i.e.:

a. Intensive customer relations provide for optimal market-orientation.
A Lean Enterprise tries to anticipate on the "real" wishes of the customers by means of active cooperation on the basis of partnership.

b. Strive for long-term relations and customer loyalty.

c. High product and service quality.

3. Integral concepts.

The philosophy underlying a Lean Enterprise is the integration of all aspects of the organization (see the seven aspect model described in subsection 2.1). In particular, this means:

a. The enterprise as an open system interacting with its environment.
A Lean Enterprise cannot be considered in isolation, but only as part of a process chain. In addition, it must also be open towards the rest of its environment, i.e. towards its economical, social, juridical and cultural embedding. This state of "being an independent part of a greater biotope" is described in (Glasl et al., 1993) as the association phase of an enterprise.

b. Establishment of common images, goals and strategies along the whole process-chain, including customers and suppliers.

c. Careful balance between specialization and integration as well as between left-hemispherical and right-hemispherical skills.
As a consequence, also purely mechanical organization models must be replaced by organic ones that are holistic and that consider not only the technical-instrumental subsystem, but the social and cultural one, too.

4. Human-capital-orientation.

The employees, and not the technical infrastructures, are the most important asset of a Lean Enterprise and deserve continuous attention with respect to:

a. Work-satisfaction by decentralizing responsibilities.

b. Careful management of the know-how, the skills and the motivation.

c. Establishment of a Learning Organization that ensures empowerment of all members by developing their operational, social and organizational abilities.

5. Partnership.

The insight that, in the long run, everybody achieves if unrestricted competition (i.e. the right of the strongest — more politely also termed as "market mechanism") is replaced by cooperation and the creation of win-win situations, is another essential concept of a Lean Enterprise. This holds not only within a company but equally well for the relations with external customers and suppliers. In more detail, this means:

a. Organization of the work around teams.

b. Trust and commitment in place of the often prevailing precautions against the assumed inabilities or bad intentions of the other party. In order to create the necessary feeling of "shared destiny", three things are essential: (1) all parties involved in a process-chain must share a common cultural subsystem, i.e. common images, goals and strategies; (2) the aim for individual short-term gains must be replaced by the strive for common sustained growth and the creation of win-win situations; and (3) there must be a fair sharing of the benefits of the cooperation.

c. Long-term relations.
Since the establishment of fruitful long-term relations requires large investments, this rule also implies that the usual, loose relations with many customers and suppliers are replaced by strong cooperation with a few key accounts.

d. Careful management of all internal and external interfaces between the process steps and process teams.
This requires three things: (1) at the level of the technical-instrumental subsystem of an organization (see subsection 2.1), the interfaces must be well defined in terms of the flows crossing the boundary, the procedures and the responsibilities; (2) at the level of the social subsystem, there must be mutual responsibility, i.e. the interface must be rather a "seam" than a cut; and (3) the partners involved in an interface must share a common cultural subsystem.

From this short summary of the principles of a Lean Enterprise, it should become obvious that becoming lean is not a matter of cutting staff or performing excessive Business Process Reengineering projects, but the result of an integral development strategy of the whole organization.

4. Lean Information Management

Since Lean Enterprise is a holistic concept, it must also have consequences related to the way information is handled. The term Lean Information Management is used to denote this dependency. In this context, Information Management is defined as the goal-oriented lifecycle management of all types of information, aiming at the effective support of learning, decision making and coordination of activities.

Based on the characteristics of the three subsystems of an organization, the general principles of Lean Information Management have been described in (Hammer, 1992b) and (Hammer et al., 1994). In this section, the operational principles are systematically derived from those of a Lean Enterprise.

In the subsequent text, the implication symbol $\rightarrow$ followed by the Lean Information Management principles written in *italic* denote this derivation relation.

4.1. Orientation at the core business processes. $\rightarrow$

Derivation of the information requirements from the core business processes.

a. The enterprise is designed around the core business processes and not around functional departments. $\rightarrow$
The information model is not only defined in terms of data structures but also in terms of information flows.

The simultaneous modeling of information structures and information flows is also referred to as process-oriented modeling (Hammer, 1997). Because of the well known (software) engineering advantages like enhanced maintainability and reusability, it is worth while to consider an object-oriented approach for modeling the business processes as well as the supporting information streams and information systems. This means that the static aspects are modeled in terms of classes and objects, while the dynamic aspects are modeled as activities (workflows) and transactions. A transaction is a part of an activity (workflow) that adheres to certain consistency requirements like the well-known ACID properties or failure atomicity. For business processes, typical objects are business units, departments and process-steps; typical transactions are customer-driven like the processing of an order or a service request. For the design of the information model and the information system, classes objects, activities and transactions have the usual meaning. The object-oriented approach to process-oriented modeling is described in more detail in (Hammer, 1997).

This rule for building an information model is especially important for Business Process Reengineering projects that aim at the achievement of strategic business advantages and dramatic performance improvements by means of IT.

b. A process manager is responsible for every core business process, including the coordination of the various functional departments. $\rightarrow$
The process manager is also responsible for the information management related to his process.

This means that after a long period where the IT-department ruled the use of the IT-resources and determined the way processes were supported, the IT-responsibility has returned to the line. As a consequence, the

central IT-department (like all other staff departments of a Lean Enterprise) is considerably reduced (or even outsourced) and most IT-specialists are integrated into the line.

c. The supporting processes (secondary processes) and management processes (tertiary processes) are subordinate to and derived from the core business processes (primary processes). →
The information requirements of all processes (including the secondary and tertiary processes) are derived from those of the primary process and the information management of these processes is tightly coupled with that of the primary process.

This rule is especially important for administrative processes that tend to become independent and blown-up entities.

d. The activities of a process-chain are triggered by the customer. →
Information on demand.

This rule asks for a complete rethinking of the usual way information is provided. Especially for the staff departments of big bureaucratic organizations, the general practice still is to scatter information throughout the enterprise; large distribution lists that contain everybody that, staff people think, might be interested in the results of their effort are an indication of this phenomenon. Lean Information Management turns this old rule upside-down by putting the responsibility "to be informed" where the need is.

The information provider, of course, needs to advert at its interface what information is available and how to get it, possibly with different access rights for different user groups. In a modern enterprise, this can be very efficiently implemented via common document servers connected to an Intranet. Such a document server maintains e.g. a hyperdocument base by title, document attributes (e.g. creation and modification date, type, size, etc.), abstract, full document, etc.
In a production environment, alternatively, the information provider can also interrogate the information needs of its clients (e.g. by periodically querying their databases) and supply the necessary information just-in-time (see also the delivery of just-in-time information below). Note that the "information on demand" principle is closely related to the "information sovereignty" principle described in subsection 4.4).

e. Continuous process improvement (Kaizen), including benchmarking. →
Continuous improvement of the supporting information flows and information systems.

Except for cases where the primary process itself is aimed at the production of information, companies often do not pay enough attention to the improvement of the supporting information facilities. In this way, efficiency reserves are not used and mismatches between the primary process and the supporting information streams are introduced. Strange enough, continuous improvement of the information systems themselves seems to be much less of a problem.

f. Responsible use of resources. →
Responsible use of information resources, implying the following two rules:

- *Minimal amount of data and maximal essence.*
  As described in subsection 2.2, one of today's biggest problems is the abundance of data that is not task-oriented, not prepared in a way that triggers people and whose management only costs money. The extended view on information described in section 2 helps in determining the information that is essential for a given task and to construct effective information filters.

- *Logistic view on Information Management (Information-Logistics).*
  Similar to material buffers, information buffers cost too and should therefore be minimized by delivering information Just-In-Time (JIT). The costs of buffering information are not only caused by the effort to collect non-essential information (in the absence of clear goals, this is what often happens for the "case of. . .") but mainly by the costs to maintain and finally dismiss it. Note that this holds for all types of information, electronic or not.

4.2. Customer-orientation. →

Problem and decision-oriented information.

The more information and knowledge driven in a business is, the more important it is to tune the information carefully to the needs of the internal or external customer.

a. Intensive customer relations provide for optimal market-orientation. →
Internal and external marketing of information as part of the "information on demand" principle described in subsection 4.1. Information is considered as strategic resource.

b. Strive for long-term relations and customer loyalty. →
The information and the related information services are aimed at the customer.

c. High product and service quality. →
High quality of information and information services.

- The quality of data is defined by their accuracy, unequivocallity, actuality and timely availability.
  In practice, it is often the case that not enough attention is paid to the fast decay of the value of information. The results are large archives and databases that have arguable value but still cost money. What usually happens is that, initially, the information seems to be very interesting, but after a while nobody has time to update it or clean it up. In addition to the judgement of the essentiality of information (see subsection 2.2), it is therefore advisable to judge the decay of the value of tion beforehand and to calculate the related maintenance costs. Only if the information can be maintained, it is meaningful to store it in a business context.
- The quality of information in general is additionally defined by their "relevance", "acceptance" and "essentiality".

4.3. Integral concepts. →

Extensive view on information (see also section 2).

a. The enterprise as an open system that interacts with its environment. →
Associative information systems.

An enterprise which is open towards its environment must also be supported by open information systems that are flexible enough to interact with the information systems of many actual and future partners. Since these information systems must support enterprises in their association phase (see section 3, point 3a), we call them associative systems. Although the unlimited exchange of information was a goal for almost two decades, most information systems still miss the openness and flexibility, necessary to achieve free connectivity. Electronic Data Interchange (EDI) provided the first set of standards that supported high-level business transactions. Nevertheless, also here many implementation details of the underlying execution platforms hampered the free exchange of data. Only with the broad acceptance of Internet, worldwide connectivity can be achieved at the implementation level too. Future information system architectures, that are based on mobile agents, will hopefully also show the flexibility that is necessary for enterprise resource planning systems working along a global process-chain. A mobile agent is a software object (i.e. a collection of closely related data together with its access routines) that shows some form of "intelligence" and that can autonomously perform tasks in a complex network environment.

b. Establishment of common images, goals and strategies along the whole process-chain, including customers and suppliers. →
Common global chain-information.

Common definitions, data and procedures at the level of the technical-instrumental subsystem must augment the common cultural subsystem of a Lean Enterprise. Although this common information must be kept to a minimum (see subsection 4.4a), it is necessary to operate the process-chain smoothly. Typically, a lot of logistic information like part numbers, product data and interface procedures, fall into this category.

c. Careful balance between specialization and generality as well as between left-hemispherical and right-hemispherical skills. →
Balance between data and essence.

As already mentioned in subsection 2.2, the important point here is the ability to transform data into future-oriented living images and to keep a balance between the operational data that is necessary in the technical-instrumental subsystem and the essence necessary to run business in a goal-oriented way. Note that this rule is another aspect of the "minimal amount of data and maximal essence" rule mentioned in subsection 4.1f.

4.4. Human-capital-orientation. →

Decentralized information management.

a. Work-satisfaction by decentralizing responsibilities. →
Information sovereignty, implying the following three rules:

   – Local management of information by the people that are its main users, e.g. a process team or a functional department. This is the only way to ensure that the information is of high quality (see subsection 4.2), because those people really need the information for their daily work. Common databases at the staff level have always been a problem: (1) because for the process-teams that work with the data, keeping a global database up-to-date has a low priority; and (2) also because the staff personnel i really interested in the maintenance. In addition, agreeing on common definitions (e.g. on data-dictionaries) and procedures is a cumbersome and long-lasting endeavor whose results have a high chance of being obsolete once they are established.

   – Minimized common IT-infrastructure.
   The problems with common databases described above hold equally well for other parts of the IT-infrastructure. There are really only two reasons for keeping IT-facilities common: (1) the consistency of shared data; and (2) the cost advantages of purchasing and maintaining shared IT-facilities.

   – Flat IT-architectures.
   One consequence of decentralizing responsibilities within a Lean Enterprise is its flat organization structure. In order to support the "information sovereignty" rule, the IT-architecture should be flat, too.

b. Careful management of the know-how, the skills and the motivation of people. →
Human-oriented information, implying the following two rules:

   – *Human-oriented amounts of information.*
   The amount of information managed by a particular person or team should be related to its control-span (i.e. the organizational entities it is interacting with) and the time-span (i.e. the extent to which it has to anticipate the future).
   In a way, this rule can be considered as a refinement of the general "minimal amount of data and maximal essence" rule mentioned in subsection 4.1f.

   – *Human-oriented presentation of information.*
   As already mentioned in subsection 2.2, the agglomeration and context-dependent presentation of data is important for the shaping of living images by humans.

c. Establishment of a Learning Organization that ensures empowerment of all members by developing their operational, social and organizational abilities. →
Training about the integral management of information and IT.

   In section 1, unconscious handling of information was mentioned as the general reason for the ineffectiveness of state-of-the-art information management methods. Although the longest and most difficult approach, the most effective way to overcome this deficiency is adequate training of people at all levels of an organization.

4.5. Partnership. →

Integration of IT-personnel into the process teams.

Real partnership also implies that the IT-specialists loose the special status they often had and work as equal partners together with process-specialists (their former users), organization specialists and other internal and external professionals.

a. Organization of the work around teams. → *Teams organize their own information.*

b. Trust and commitment in place of the often prevailing precautions against the assumed inabilities or bad intentions of the other party. →
Free exchange of information.
Information must not be retained in order to gain power.

c. Long-term relations. →
Information as important means to create win-win situations.

d. Careful management of all internal and external interfaces between the process steps and process teams. →
Careful management of interface information, including control and feedback information.

5. Conclusions

Lean Enterprise is an important paradigm for the next decade of industrial evolution; not in the short-sighted sense of making organizations "lean" by discharging people, but in the holistic sense of developing the whole organization in order to increase its performance and effectivity. If we consider a Lean Enterprise as an integral entity, it should also have a Lean Information Management.

We have derived the principles of Lean Information Management from those of a Lean Enterprise. This exercise has led to a number of new and surprising insights into the nature of information and its management. In conclusion we want to summarize the five most important rules:

1. Information must be goal-oriented.
   Among the rest, this implies the minimal amount of data in the technical-instrumental subsystem of an organization and the maximal amount of essence at the level of the cultural subsystem.
2. The information requirements of all processes must be derived from the core business processes.
3. Information provision on demand.
4. Information sovereignty.
5. Information-Logistics: Minimal buffering and just-in-time availability of data.

Acknowledgements

The author thanks his colleagues from Trigon Unternehmensberatung (Graz, Austria), and especially Hannes Piber, for many important suggestions and stimulating discussions.

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Received: October, 1997
Accepted: December, 1997

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