



Daadkracht in vooruitgang

# “Even a stone can fly”

CMII

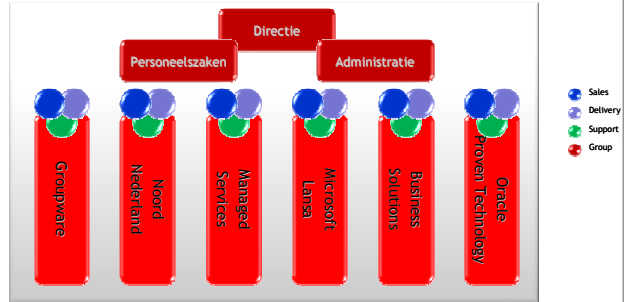
### Arno van Steensel

- **Bsc Aeronautical Engineering (Haarlem)**
- **Worked as:**
  - Implementation Manager (KPN)
  - Head of Department (Stork Fokker)
  - Project Engineer (Nedtrain)
  - Consultant:
    - Systems Engineering (CMM) (Airbus, Rijkswaterstaat)
    - Configuration Management (Airbus, Parker)
    - Requirement Management (ECN, Daf, Airbus)
- **CMII professional since 2007**




## IlionX

- Dutch company
- 230+ employees
- Seated in Utrecht



- High quality services
  - Consulting
  - Development and implementation
  - IT Management

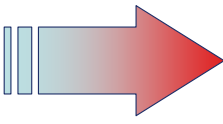
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## Developing Software

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### Government IT Project - Integrated functionality

- Project start 1999
- Planned production 2002
- 50 M€
- Employees: Peak 120-150



- In Production 2008 ⇒  
Functionality Management
- 2-3 x original M€ incl  
helpdesk
- Employees: 100 incl  
helpdesk
- Evaluation 12-'07: 1 mayor  
department not satisfied.  
To drop out ⇒ 2 customers
- Backlog: 20.000 hrs of  
changes

It is very common that projects get delayed resulting in overrun in budgets. Often project organizations seek a solution in more team members, developers. But this does not result in getting the project on track.

**ilionx** Assured IT Solutions **Conclusion**

**Conclusion:** In the end  
It will work!

- Not meet expectations
- High risk
  - Functionality
  - Stability
- Too late
- Too expensive

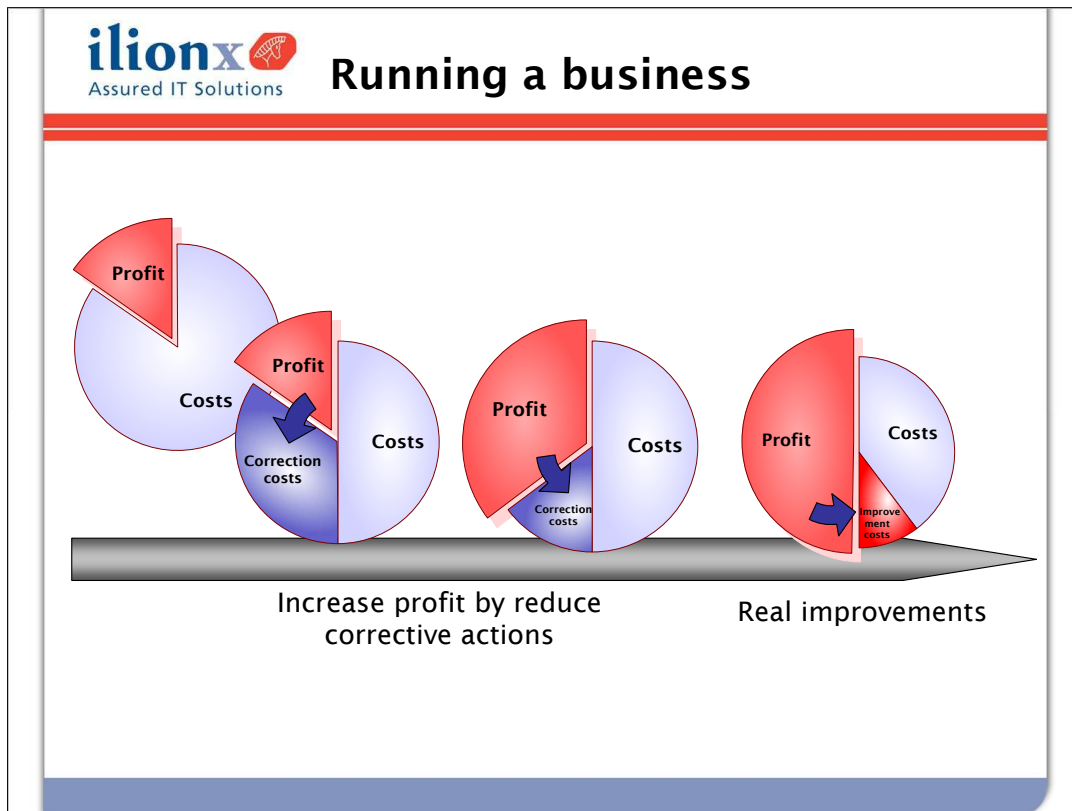
**Out of business**

In the end projects will always be finished. But against what costs? Under the pressure of time and money choices will be made to get it to work. These choices will be in disadvantage of the quality of the product: functionality, stability. There is a big difference in the amount of work to create something that makes the customer a happy customer or to just comply with the requirements. When there is not enough time the choices are made to just comply with the requirements.

Smaller companies will not survive the burden of budget overruns and dissatisfied customers!

As said by Aeronautical Engineer Ir. K. de Vries: "Even a stone can fly". Whatever aircraft you built, if you give it enough thrust: it will fly."

With this he means that in the end with enough effort, you are able to get everything to work, but against what costs or what quality?




Of products companies produce the prices (revenue) are composed out of profit and costs.

A part of the costs are costs that are unnecessarily the result of corrections that need to be done during developing. If a company is capable of reducing those correction costs the result will be more profit. This can also be used to lower the price of the product for competitive advantage.

CMII as a Configuration and Change management method has the goal to prevent corrective action by keeping requirements clear concise and valid. When a organization is able to do that there will be less corrective action. A byproduct of good method will be that work can focus on improving the product.

A company will than have 2 competitive advantages:

1. Competitive product price
2. A better product



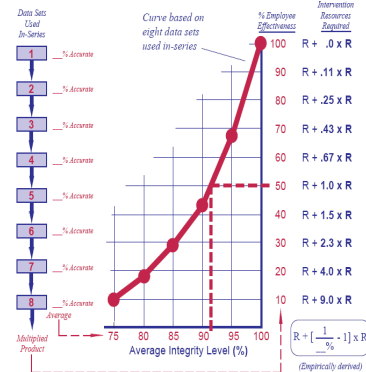
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## Corrective action

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- **Corrective action = the extra effort required to correct and/or compensate for something that should not have happened in the first place.**
- **Any time spent in a state of uncertainty about what to do, or how to do it, is also a form of corrective action.**

- **Due to data integrity:**



Average Integrity Level (%)	% Employee Effectiveness	Intervention Resources Required
100	100	R + .0 x R
95	90	R + .11 x R
90	80	R + .25 x R
85	70	R + .43 x R
80	60	R + .67 x R
75	50	R + 1.0 x R
70	40	R + 1.5 x R
65	30	R + 2.3 x R
60	20	R + 4.0 x R
50	10	R + 9.0 x R

Source: ICM

Corrective action has several causes. 2 major causes are very common:

1. Bad data integrity
2. Bad procedures for processing data.

Bad data integrity:

If the information used by developers is not entirely correct he/she will have to make assumptions. These assumptions can be wrong! So you are depending on the guesswork of a developer. A developer's output will be used by others as well. Developers of other people. Of the data used as input is for 95% accurate. The person processing it will also make a 95% accurate output. And so will the persons do that use his output as input. If more processing steps occur in series, the data integrity can be calculated by multiplying the accuracies:  $Accuracy = x^n \%$

The university of Arizona calculated the employee effectiveness as a result of data integrity. This can be used to calculate the amount of resources needed for corrective action. It is important for companies to understand that data integrity results in corrective action.

Example: Due to bad version management within a project the company had to change 10.000 recently delivered documents. They only had to check and update the version data on the documents. With the existing software tools and procedures each document took 1 hour of work. Estimated costs: 250.000 €.

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## Corrective action

- It is generally assumed that the purpose of corrective action is to fix mistakes and that mistakes are made by "workers." This is wrong.
- Due to process:

Source: ICM

Correction action is a symptom of poor communications. Any requirement that is not clear, concise and/or valid contributes to poor communications. Good communications are optimized when each form, and all documents referenced therein, are clear, concise and valid.

Each form and each document is a requirement to its user.

The root causes for corrective action remain hidden because each deficiency, in itself, is often insignificant. A word was misspelled. A number was transposed. A document was misfiled. The wrong revision was issued. A procedure is not clear. Such incidents are common and, though not intentional, expected. Some say it is the "nature of our business" or "the world is not perfect." Such defects are assumed to be harmless, but they wield tremendous power if allowed to multiply.

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## Corrective action

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Source: ICM

The ultimate solution imposes the following rules:

- (1) Documents must be validated prior to release.**
- (2) Documents must be released prior to use.**
- (3) Any detected deficiencies are corrected prior to reuse.**
- (4) Results must conform to requirements in every case.**

Many professionals are shocked at the idea of working to such rules. They say their organization would be shut down. Many of those same professionals rely on deviations and waivers to get through each day.

The results of poor communication in a cumbersome procedure is shown with the red line.

This way the change may cost more than expected, will be delivered not according to schedule, and as a result it will fail the required performance. So it corrections are still needed, which will lead to new requests for change.

When a process accommodates the change and the information generated is clear concise and validated, the result will be clear and will meet the required changes. Applications will work consistent to the requirements. Then the changes needed will only be changes to further improve the application.

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## Requirements

- Configuration management is essentially requirements management.
- Requirements may exist, but if not clear, concise and valid, individuals may do the wrong things.
- A requirement is not a requirement unless it is documented, validated and released."

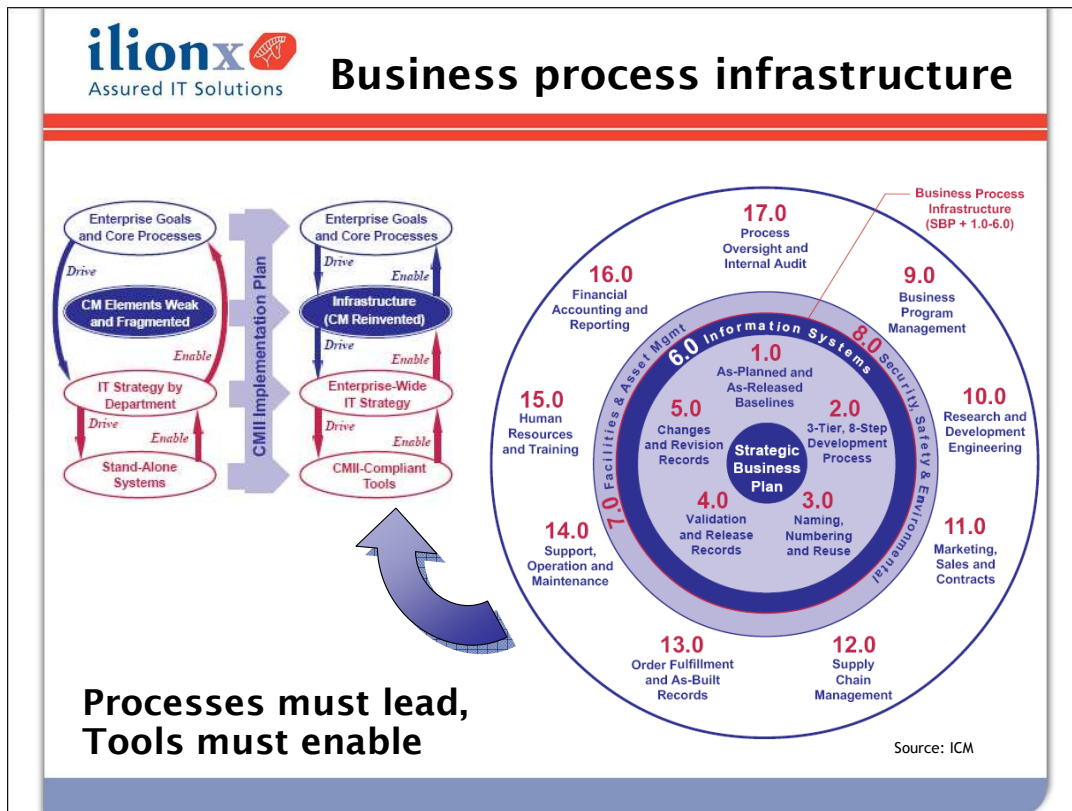
Source: ICM

Every organization has customers. Every organization has products and/or services intended to satisfy the needs of those customers.

Every organization has delivery systems to achieve each applicable phase of the life cycle for those products and/or services.

Every organization must continuously improve its products and/or services and its delivery systems if it hopes to stay in business.

To run a business it is important to know the needs of the customer. Your products & services which comply with those needs are described in documents. The description of all the delivery systems to make those products & services are also described. These are tooling, software, operating standards and the organisation. The description of how these systems and products are configurations. They are essentially requirements for those systems and products in order to meet the customers needs.



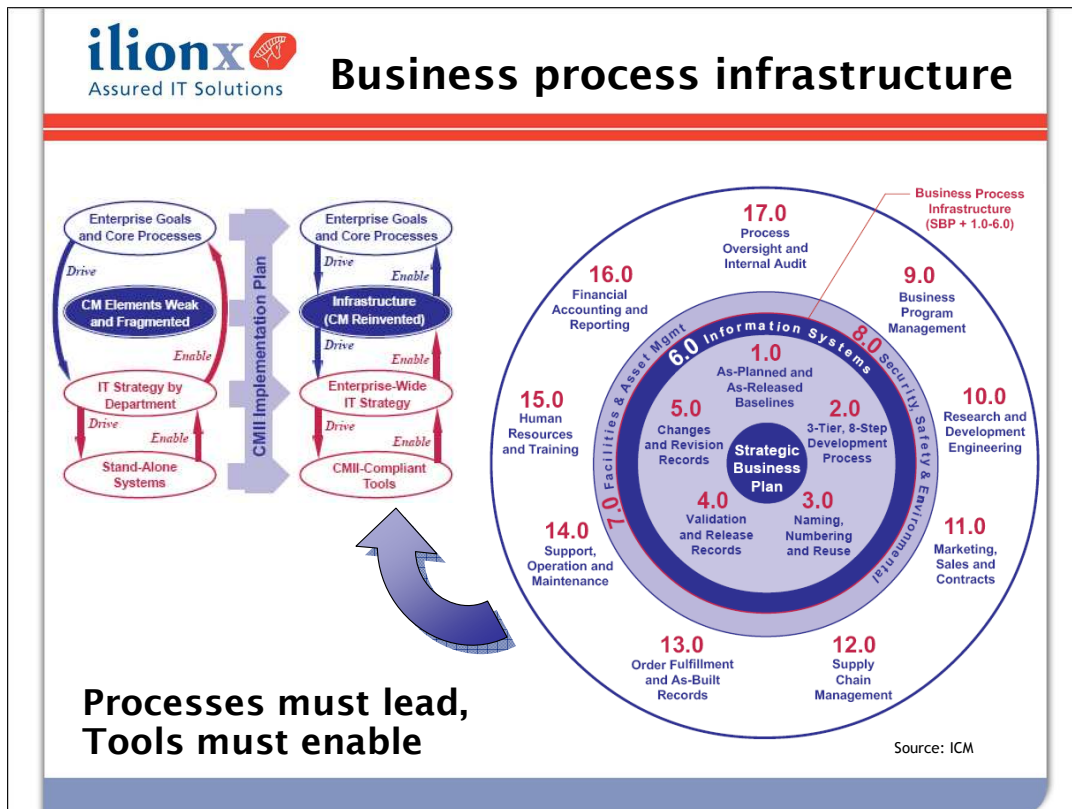
The core business processes and/or disciplines commonly found in most organizations is shown.

Each core business process represents a special discipline. The discipline could exist and not be identified as a core business process. CM is typically identified as a discipline but not a core business process.

Furthermore, it is was never clear as to how CM should be included in the process or where it should reside. Overall efficiency is optimized when all processes are requirements driven. Requirements and changes must be clearly communicated. A sound business process infrastructure is needed to ensure that requirements and changes are communicated and coordinated.

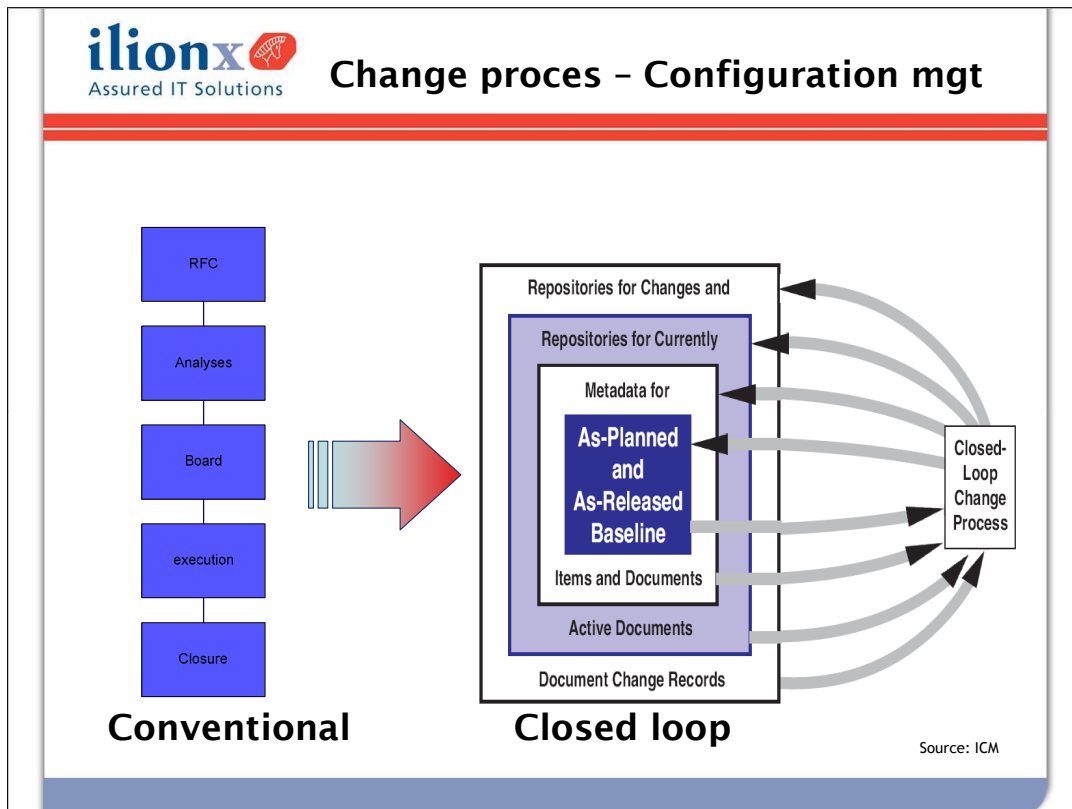
Much of the needed infrastructure is provided by the CM process. Therefore CM should be a core process. The core CM process includes five key components as shown below.

Proper relationships between the various core business processes, and the CM components, are further clarified by the illustration. The core CM process, and its five components, provide much of the business process infrastructure that is needed. Core business processes in the outer portion of the sphere are enabled by the core business processes, or infrastructure, in the center.



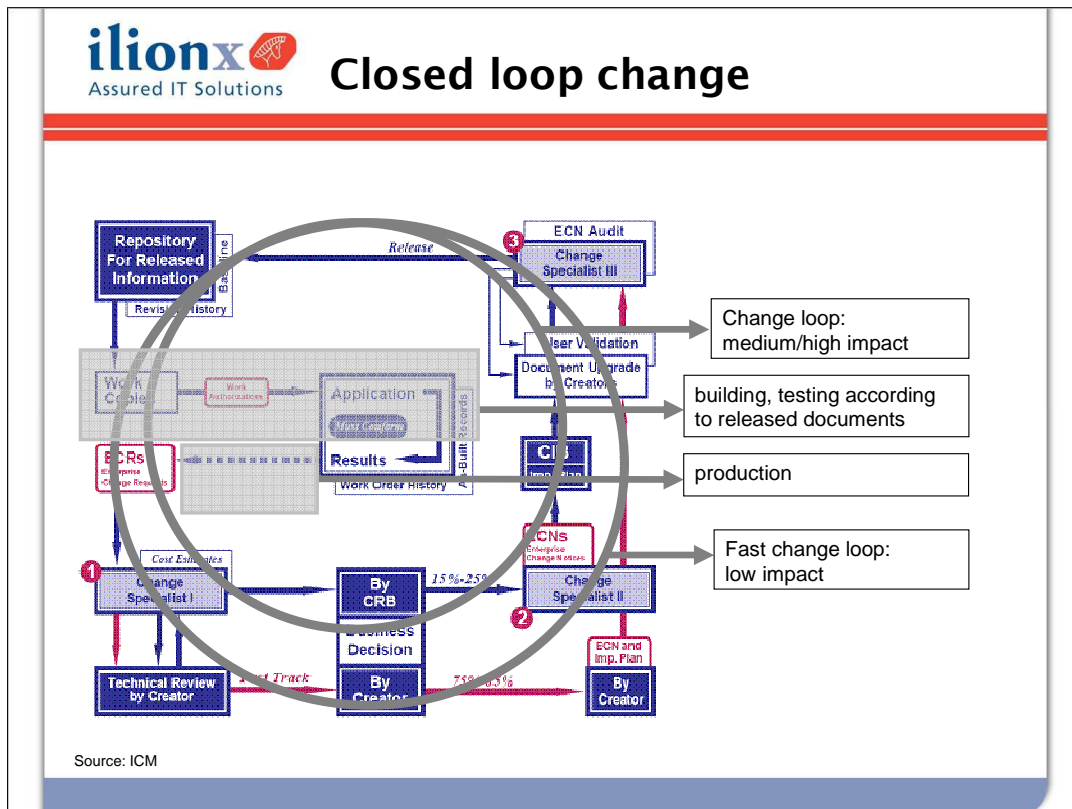
Upper management in most organizations has a good understanding of their objectives and their core business processes. Most of them, however, continue to struggle with process automation. Results do not meet expectations regardless of the amount spent.

The reason is very clear. The CM elements are weak and fragmented. The appropriate automation drivers are missing. The proper solution, as shown, has universal application. If Upper level enterprise goals and strategy pays down requirements for the process writing the organization, the IT can make an IT strategy based upon real requirements. Then the IT tooling will not be fragmented anymore, but a lean and efficient chosen.



Conventional change processes start with an RFC and end with the closure of the IT. Actually the beginning of a change are configuration description using data, documents, forms and records that somehow needs to be changed. The result of a change are update data, documents, forms and records that describe a new configuration.

Therefore a change process should be a closed loop where the configuration data is the start and end point.



The CMII change process:

Starting from a production environment there are needs for change written in an Enterprise Change Request (ECR).

1. The first step is that the current situation is analyzed. An impact analyses is necessary. It should state what needs to be changed, which documents that describe the requirements of the application, tooling, processes, etc.. The current situation and the end situation. And also what the next version and effectivity of the documents should become. To make a decision also costs estimates, risk are necessary. This information is gathered by a change specialist that prepared the meeting of a board that makes a business decision (GO-NOGO).
2. Then a change specialist uses all the information of the Change requests to plan the work to change the documents. This specialist knows the planning, availability of the resources so he can make a liable implementation plan. This is written in an Enterprise Change Notice (ECN). An ECN can contain more ECRs to be more efficient for planning. Also an ECR can be divided into more ECNs. The change specialist prepares a board that has the mandate to approve the planned work for the resources.
3. Then the work is carried out. All the describing documents are changed according to the description in the impact analyses.
4. A third specialist verifies the documents whether they are according to the impact analyses. If so he releases the documents to be stored in the repository.

The real change had been done.

5. With forms as work authorizations the writing of code, testing and release can be ordered according to work copies of the released documents. Than the loop is closed.

It is proven that 75 to 85 % of all changes are minor changes i.e. grammar, lay-out. To enable these changes CMII has a fast-loop. This loop follows the same steps only it makes the creator of the documents to be changed responsible to follow the steps. As CMII has 2 responsible persons for each document, the creator and a designated user. It assures that all steps are followed. These 2 can do the change planning on mutual agreement.

The CRB board is still responsible for changes done via the fast loop. Therefore the board lays-down the criteria on which is decided if a change can do a fast loop.

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## Dynamic baseline

**AS-PLANNED AND AS-RELEASED BASELINE**

End-Item ID No. \_\_\_\_\_ Date/Time \_\_\_\_/\_\_\_\_/\_\_\_\_

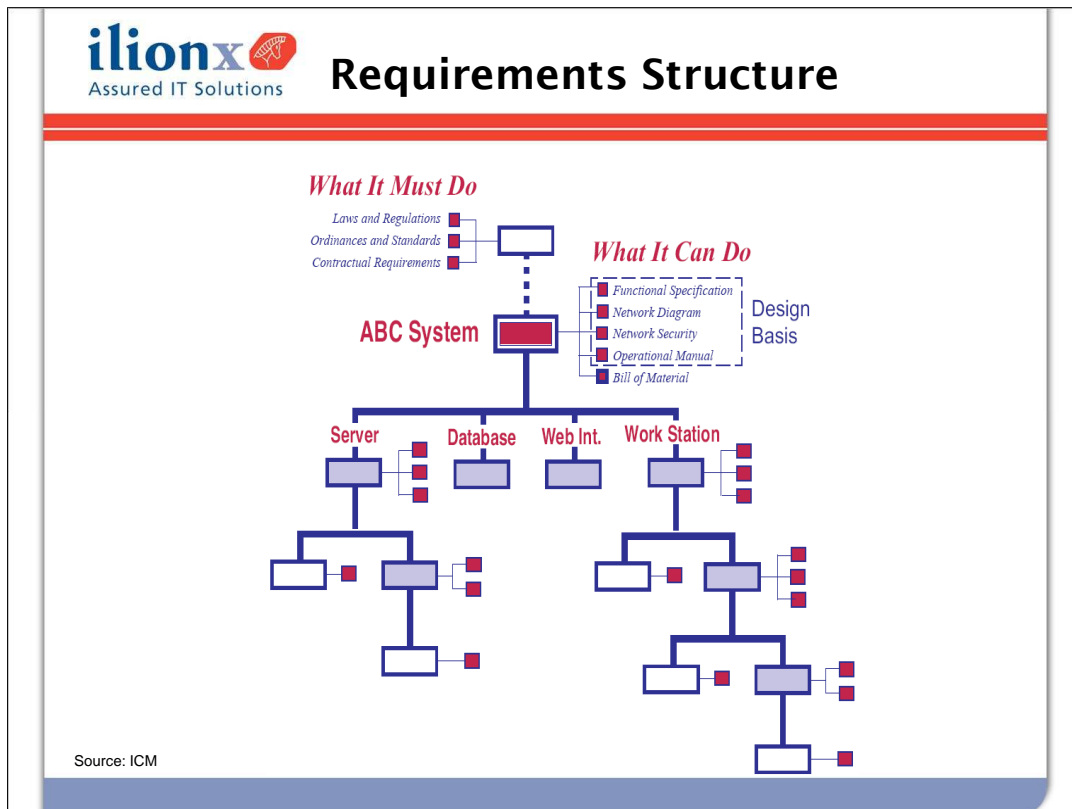
Physical Items			Supporting Documents					Changes			
Hierarchy (Qty per)	Item Number	Item Name	Type	Number	Rev	Rel. Date	Eff. Date	ECN	A/D	ECN	Effectivity
0	NNNN	XXXXXX	TT	NNNN	R	DMY		---			
1	NNNN	End Item	TT	NNNN	R	DMY	DMY	NNN			
			TT	NNNN	R	DMY	DMY	NNN			
			TT	NNNN	R	DMY	DMY	NNN			
			BM	NNNN	A	DMY	DMY	NNN	D	NNN	DMY
			BM	NNNN	B	DMY	DMY	NNN	A	NNN	DMY
1	NNNN	XXXXXX	TT	NNNN	R	DMY	DMY	NNN			
1	1234	XXXXXX	TT	NNNN	R	DMY	DMY	NNN	D	NNN	DMY
1	2345	XXXXXX	TT	NNNN	R	DMY	DMY	NNN	A	NNN	DMY

Source: ICM

In conventional CM there are static baselines of CMDB.

Now wouldn't it be nice to know which documents will change, when and for what? CMII uses dynamic baselines called as-planned and as-released baselines. It should be possible to generate these baselines at any time. Then you have the real status of your configuration.

The overview shows the physical items in that part of the configuration and how often this item occurs in the product breakdown structure. Instead of physical items it can also be operating standard, or modules etc.. Then it shows the describing documents that will be changed with the current revisions and the next revision. At the last column it shows under which ECN (ECR) number the document is changed and whether the document will be deleted or new (added) It also shows its expected effectivity. But that is not the real planning!



CMII hand-out how to build up your product breakdown structure. It describes the need of a design basis containing 4 documents that describe the top level of your product. Every item at level lower has a number of describing documents containing the requirements for that item. These requirements describe what the item *can do* when it is made according to those documents.

Every item in a level is decomposed in lower level items where every item combine should still give a full description of requirements for the higher level item.

CMII adds an extra level at the structure. A level "zero". These are the customer (application) requirements. These documents describe what the product *must do*.

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## Requirements Structure

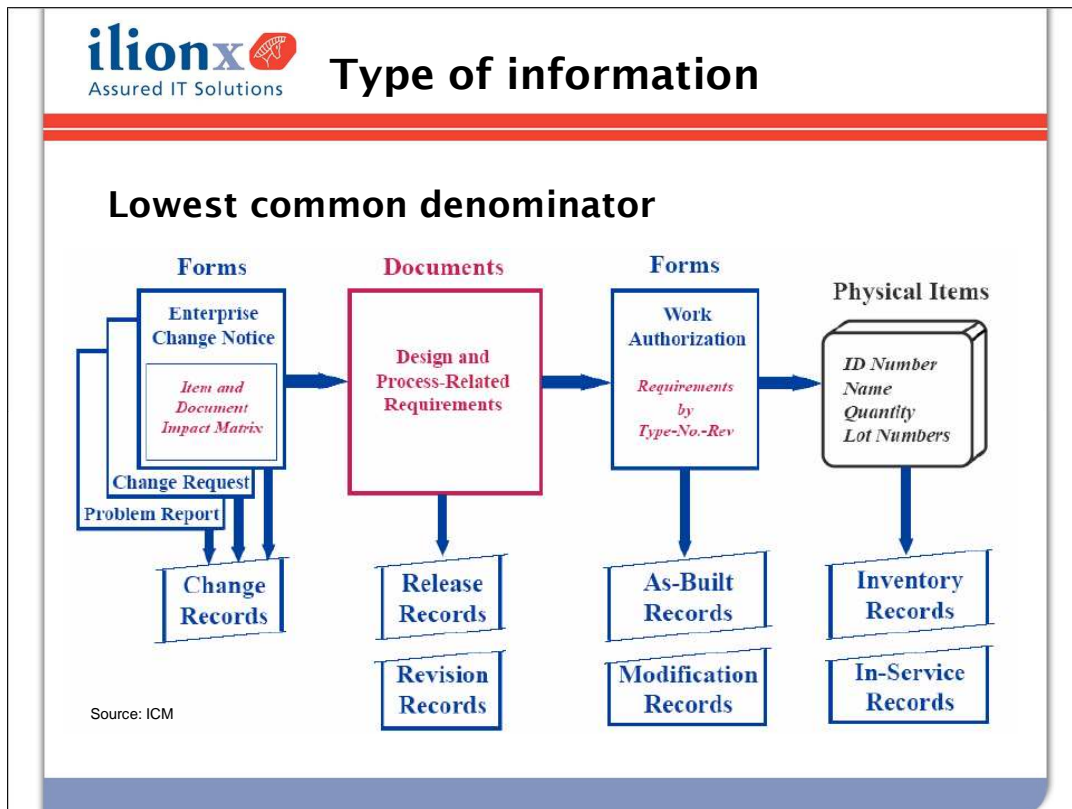
**An example PBS of software:**

- Already in early stage of development
- Use of place holders

Source: ICM

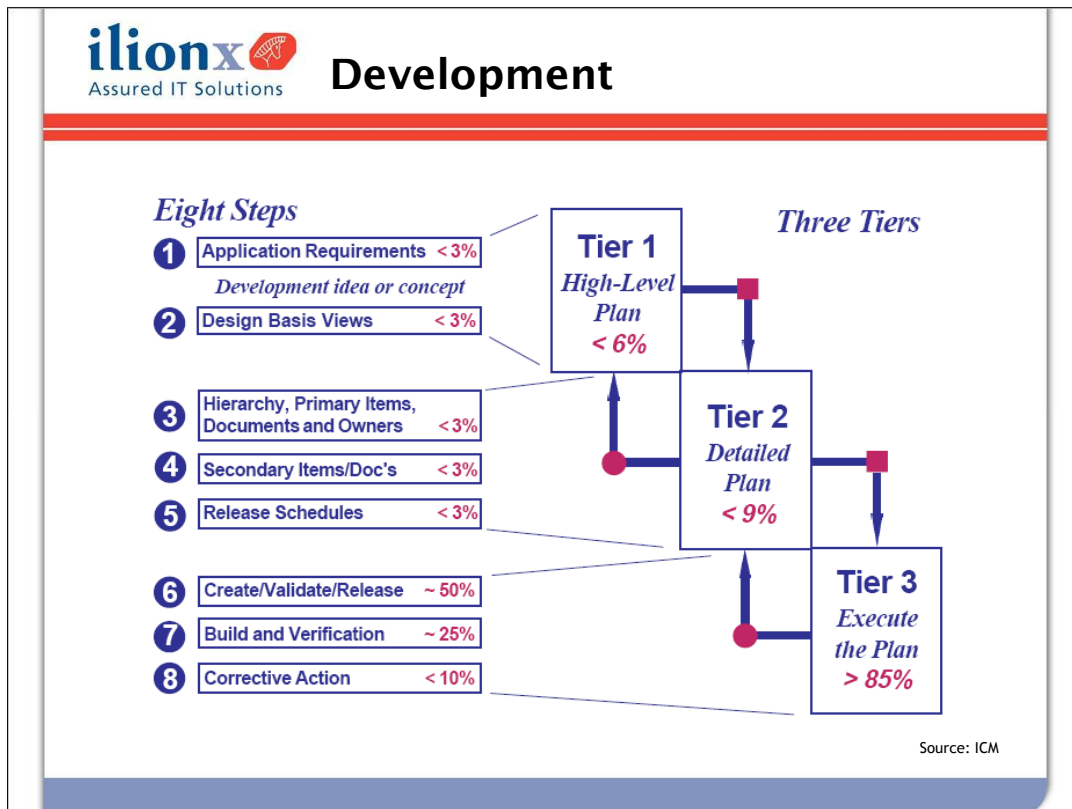
When a product breakdown structure should be made as early in the development as possible. That way the project is clear concise and validated for everybody involved.

When parts or branches are not clear or decided that early in a project, one can use place-holders in the structure.



CMII uses 4 “lowest common denominators” as information handles as shown in the illustration:

1. Physical items (can also be modules, operating standards or other item for Configuration Management)
2. Forms
3. Documents
4. Records

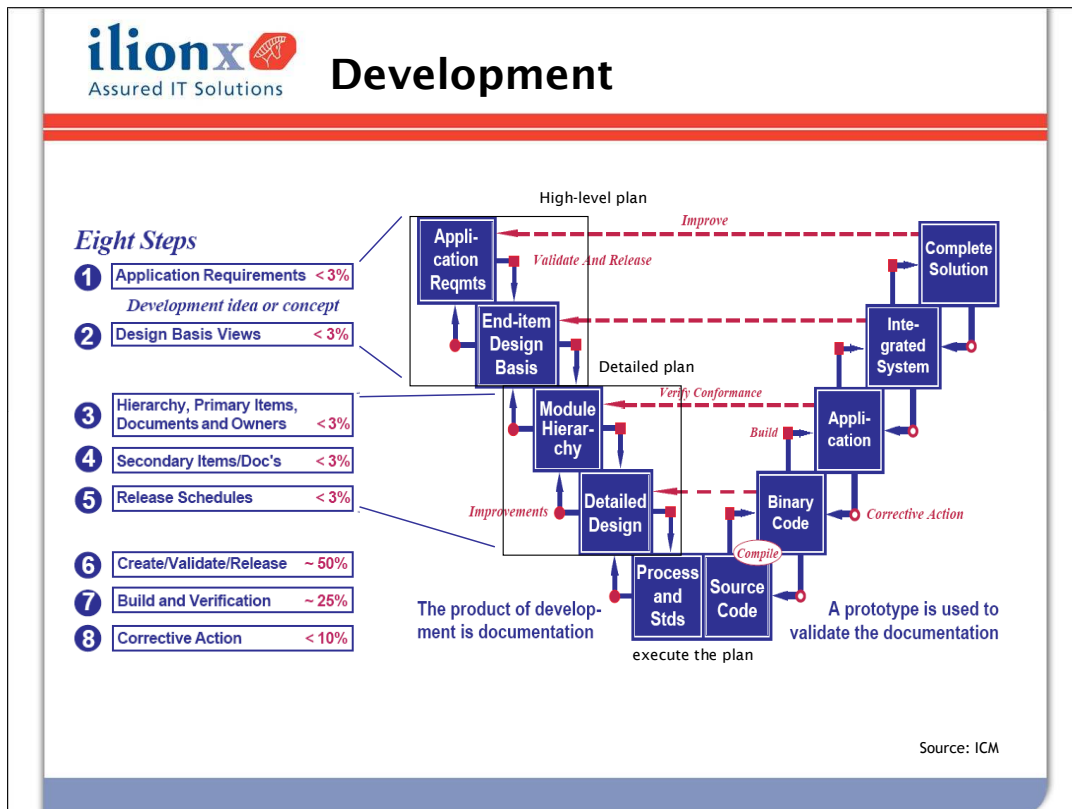


CMII describes how to develop to get to a end result with as less corrective action as possible: The 8 steps 3-tier plan.

At the first tier, the high level plan, the application requirements are elaborated from the customer and other requirements like regulation etc. Against those requirements the design basis is made. The documents that describe the top level of the product. These steps together will cost 6% of all the development effort but it locks in over 90% of the total life cycle costs of the product.

The next tier is the detailed plan. It serves to expand the high level plan into a hierarchy of detailed plans and consumes less than 9% of the total development costs.

The remainder of the development effort, over 85% of the total costs is used to execute the detailed plan.



The execution of the plan consist of more steps from lower level part descriptions (documentation) to integrated parts (documentation) which all should be verified against the plan and in the end validated to the application requirements.

When problems of deficiencies occur lower or higher level documents should be changed using the change process. A change can only affect one level higher of lower. It should not be possible to skip a level!

***CM As Traditionally Defined***

*A discipline applying technical and administrative direction and surveillance over the life cycle of configuration items (CIs) to:*

- (1) Identify and document the functional and physical characteristics of CIs.*
- (2) Control changes to CIs and their related documentation.*
- (3) Record and report information needed to manage CIs effectively, including the status of proposed and approved changes.*
- (4) Audit CIs to verify conformance to documented requirements.*

MIL-STD-973, Configuration Management, 1992 ISO 10007 Quality Management — Guideline for CM, 2003 ANSI/EIA-649A National Consensus Standard for CM

***CM With Expanded Scope and Shift in Emphasis per CMII***

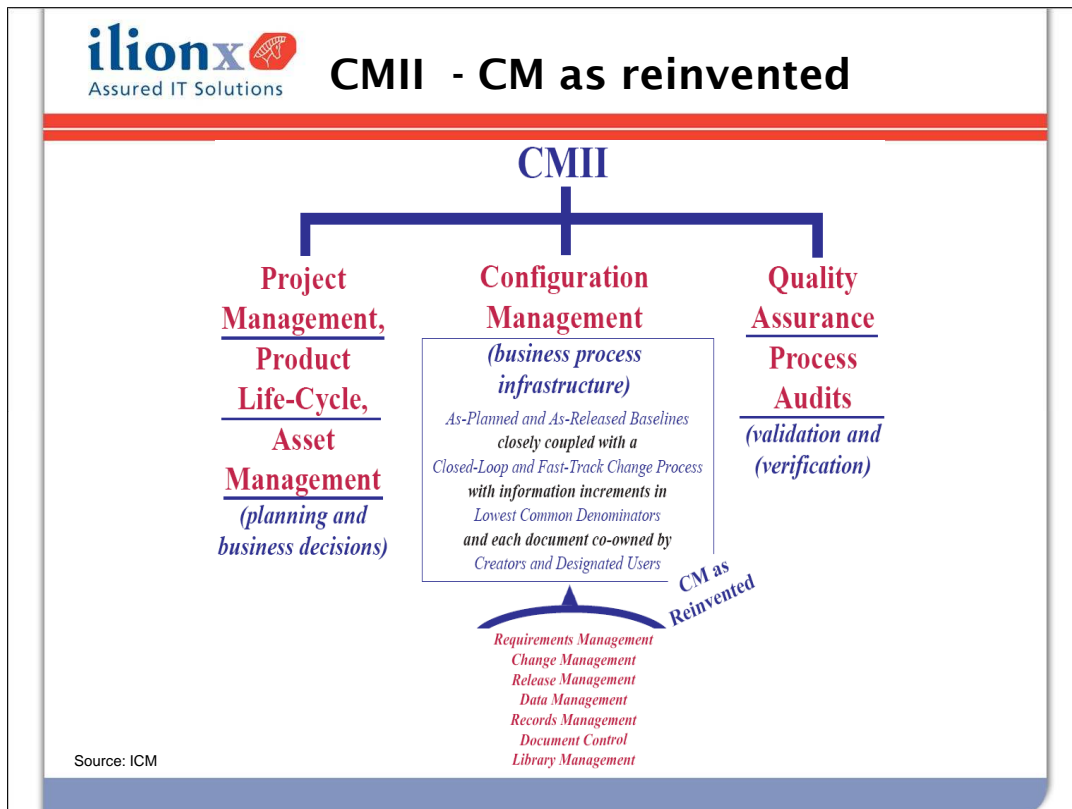
*CM is the process of managing products, facilities and processes by managing their requirements, including changes, and ensuring that results conform.*

*CMII expands the scope of CM to include all information which could impact safety, quality, schedule, cost, profit or the environment.*

*CMII also shifts the emphasis of CM to:*

- (1) accommodate change,*
  - (2) optimize the reuse of standards and best practices,*
  - (3) assure that all requirements remain clear, concise and valid,*
  - (4) communicate (1), (2) and (3) to each user promptly and precisely, and*
  - (5) achieve conformance to requirements in each case.*
- CMII promotes continuous improvement in (1) through (5).*

The Institute of Configuration Management, 1988



CMII as a new way of CM expands its scope to control more processes than a change process only.

It accommodates change. And using the correct information, clear concise and valid, it enables good planning, project management. It also gives information handles for Quality Assurance, process audits.

This is a paradigm shift from the conventional CM!

CMII is the only CM method that describes in detail how to perform CM. It is still valid all types of organisations and configuration items.



**More information about CMII**

[www.icmhq.com](http://www.icmhq.com)