International Council on Systems Engineering
A better world through a systems approach

Streamlining Engineering in Growing SMEs

A Framework of Guidelines and Checksheets for Knowledge and Project Improvement

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Hello.

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What is the problem?

Inconsistent documentation, lack of standards and supports (as SME:s grows and take on larger projects)

Increased regulation, & compliance (General growth of scope, in this case specifically environment and safety)

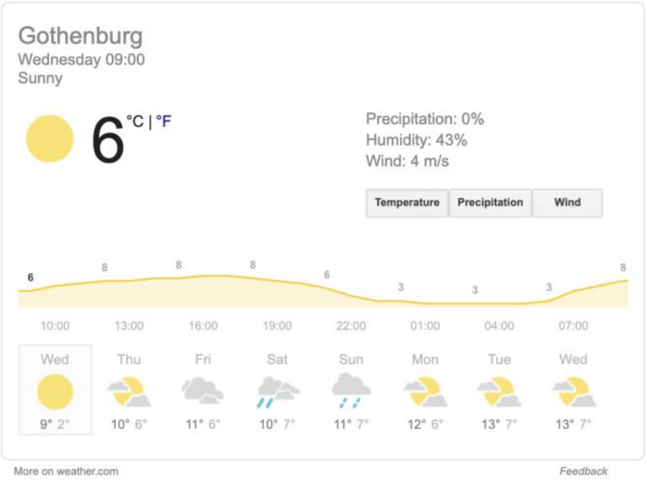
Research Background: Engineering Knowledge

From Data to Knowledge

Data - are unprocessed signals communicated between any nodes in an information system

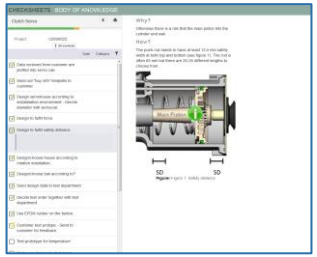
Information - is data that has been processed to provide further meaning

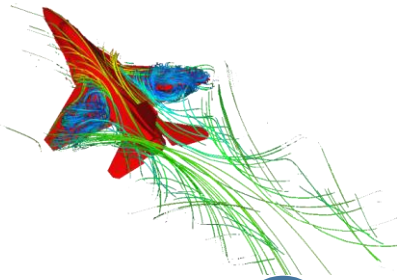
Knowledge - is information that has been analyzed to provide meaning or value



"This is cold for the season, I'd better wait taking off the snow tires."

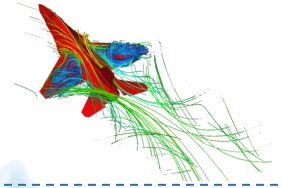
"Make decision or take action"





1 Unstructured Knowledge & Information → 2 Structured Information (& knowledge) → 3 Reusable (incomplete) knowledge → 4 Automated knowledge reuse

How can we make more (and not perfectly defined) knowledge reusable for engineers in their daily work?

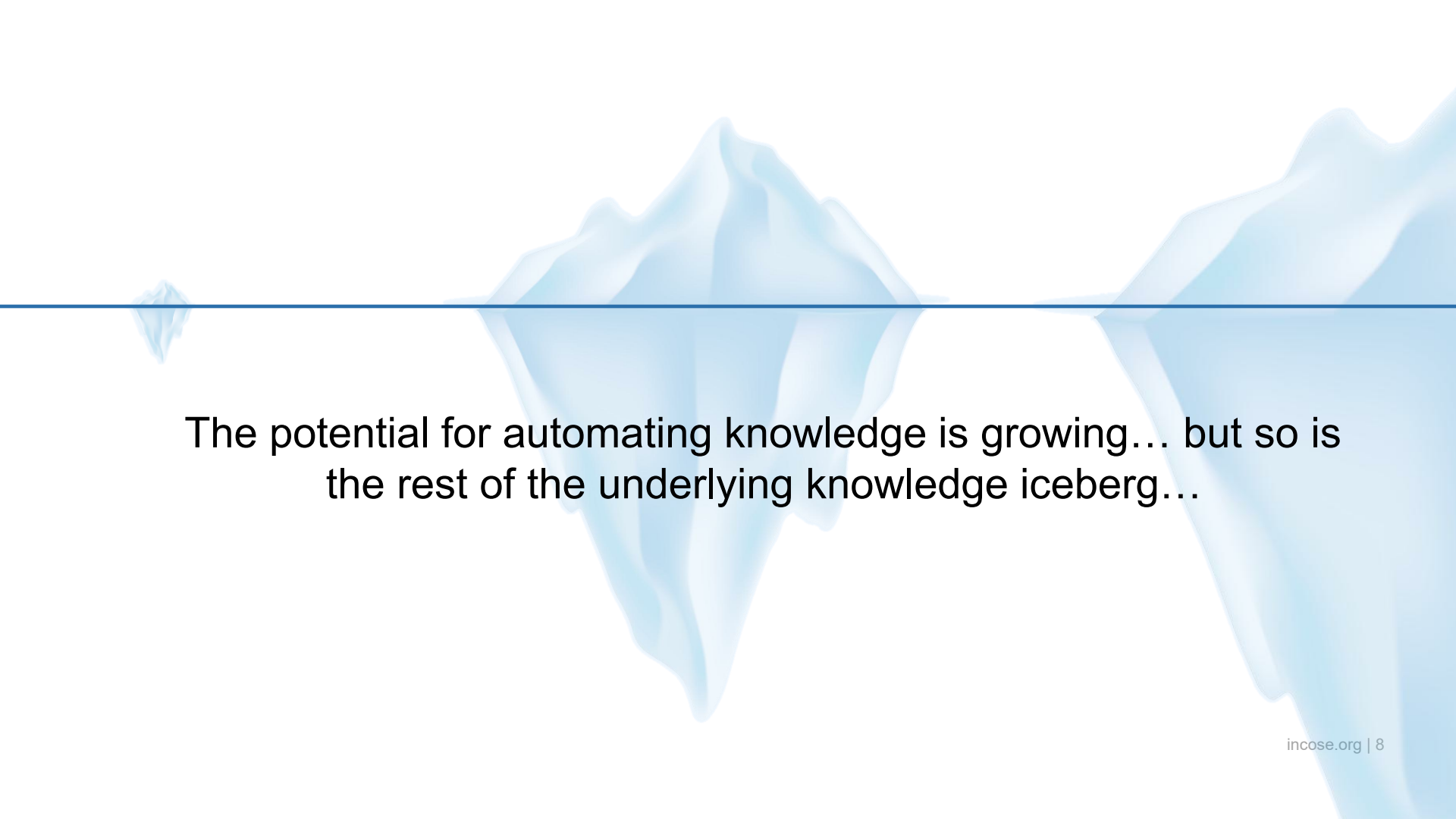


Automated knowledge reuse

Documented and reusable knowledge

Documented and archived information

Not documented or not aware of



The potential for automating knowledge is growing… but so is the rest of the underlying knowledge iceberg…

What kind of “framework” where we looking for?

Light weight (or tailored) support for a variety of projects and complexity levels

Research Questions:

RQ1: What specific knowledge management inefficiencies in project documentation and communication hinder project management effectiveness?

This question aims to identify and understand specific shortcomings within the case company's project documentation and communication processes, focusing on where knowledge is poorly managed or lost, thereby impacting project efficiency and outcomes.

RQ2: How can the development of a tailored guideline and accompanying checksheets address these inefficiencies and improve project management practices?

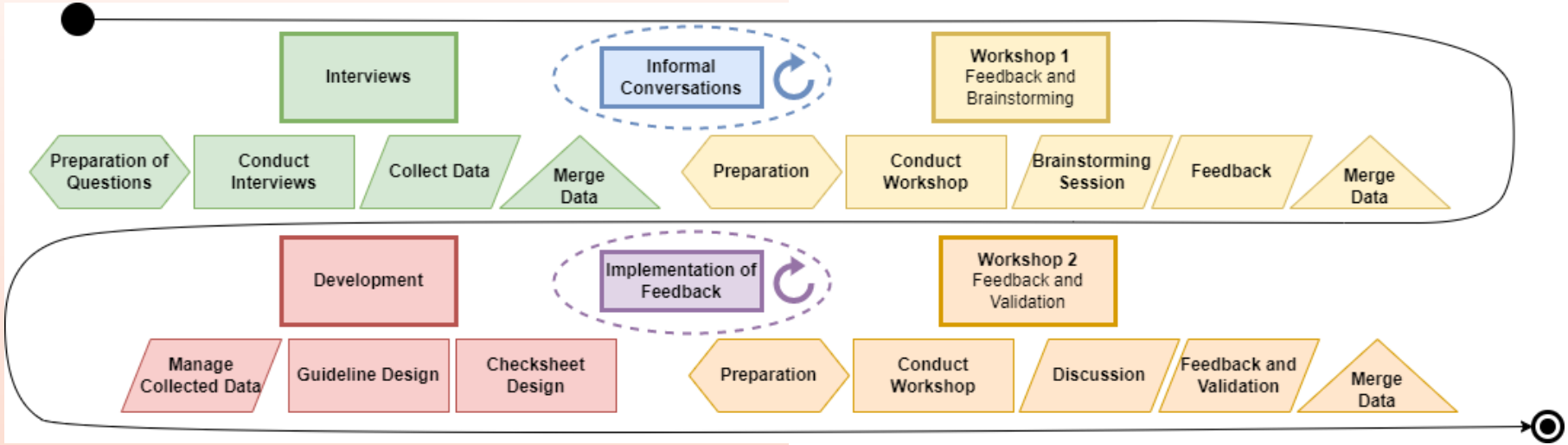
This question focuses on developing practical solutions, such as guidelines and checksheets, to address the problems identified in RQ1. The solutions aim to enhance knowledge capture, sharing, and utilisation across projects.

Research Methodology

Iterative, qualitative mixed-methods approach

Interviews, workshops

Analysis



Findings (from the case)

Results

Disagreements			
Available Tools	High seniority: mostly satisfied	Llow seniority: Tools are outdated / cumbersome	Tools a daily challenge for low seniority persons
Quality	Managers: Wishes more quality checks	High seniority: Happy with today's solution	Low seniority: More QA to ensure the correctness of work
Ease of Finding Information	High seniority: Has experience to find what they need	Low seniority: Struggles with finding information	Both groups: Difficult to find up-to-date versions

Disagreement on appropriateness of current tools

Disagreement on need for quality check/control

Disagreement on difficulties on retrieving info.

Agreements							
Project Challenges	Communication with customer	Unclear scope	Workload and time	Poor customer documentation			
Daily Challenges	Frequent changes	Workload (multiple projects)	Time spent on 'firefighting'	Work differs from person to person	Interruptions	Time-consuming emails, meetings, and communicating	
Checksheets	Generally positive	Better alignment	Facilitates handovers	Effective if easy to use, concise, clear, self explanatory	Good with reminders on what needs to be done	Potentially cumbersome/ taking up time	Might not be done well enough
Guideline	Neutral/positive	Checksheets were of a higher importance					

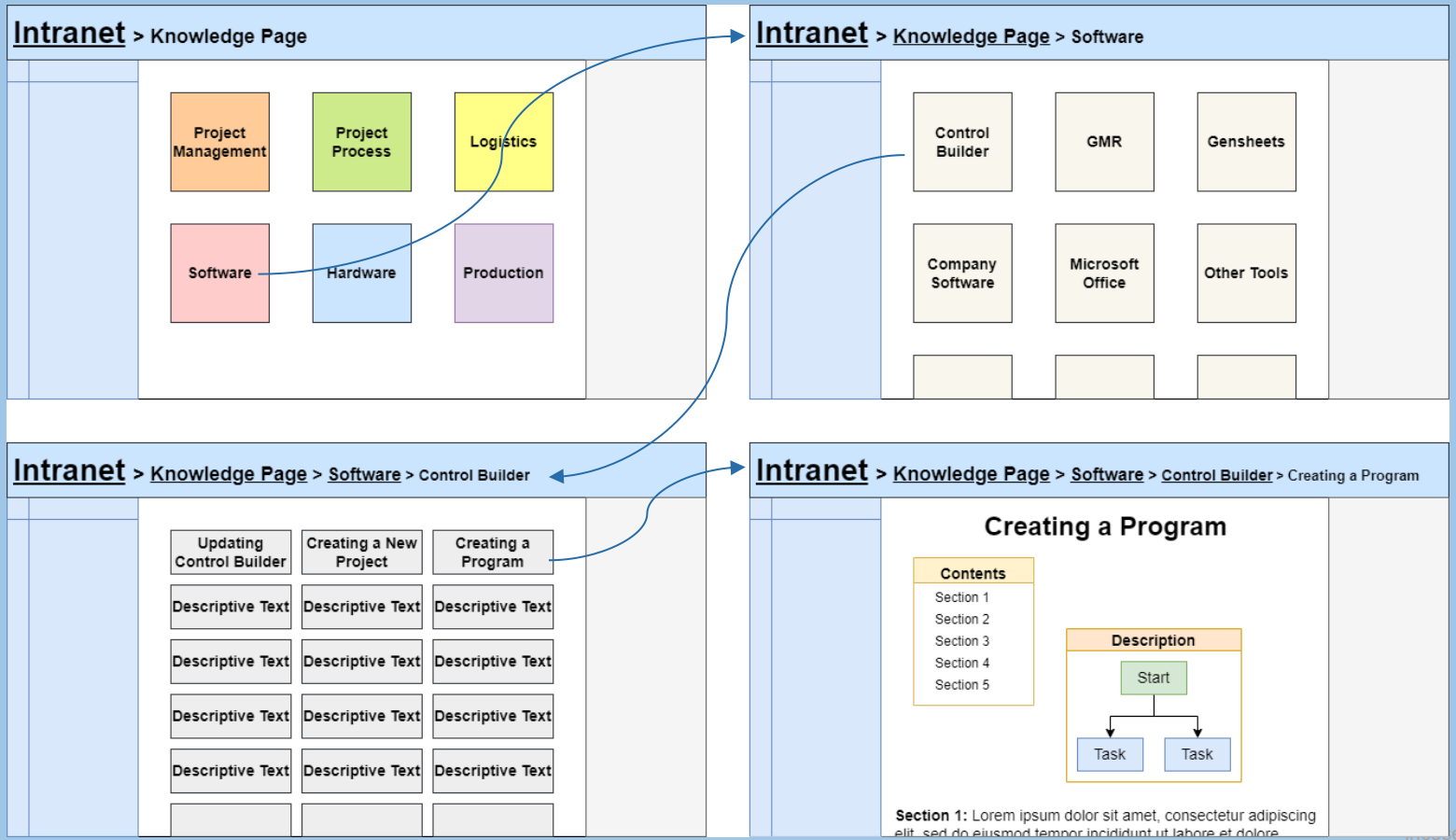
Example checksheet prototype

#####
Project Name and Description

Rev. 01

Checksheet ID#

Status	Activity Type	Task - (WHAT)	Instructions - (HOW)	More Information - (WHY)	Comments	Sign.	Initials	Date	Milestone	Quality Gate
Complete	Handover	Handover meeting from Sales	Follow the handover checklist found here according to the procedures	To ensure a proper handover between departments without information loss. Part of the company quality guidelines		Sign.	SSK	01/04/2024	1	1
						QC	MGR	01/04/2024		
In Progress	Hardware	Create Hardware List, Order long lead items	Create a first revision of the hardware list and order the most important and basic items (controllers, communication interfaces, minimum required IO, Computers and Monitors, etc.). Refer to the Guideline	To ensure the basic hardware is acquired. Price increases for hardware may occur over time	Awaiting feedback available stock	Sign.	SSK	04/04/2024	2	1
						QC				
Deferred	Kick-off	Kick/off meeting with Customer	Gather necessary information (Timeline, scope, new hardware, equipment, interfaces, P&IDs, IO list (if applicable)) See relevant info on the Knowledge Page	To ensure the scope is clearly defined and that responsibilities are clarified	Customer not available before week 16	Sign.	SSK	11/04/2024	3	1
						QC				
In Progress	Documentation Review	Review the provided documentation from the documentation	IO list, P&IDs, system philosophies, interfaces, IO requirements. See more information on the Knowledge Page	Missing or unclear documentation may increase cost and risk in the project, and cause delays. Read more about good documentation	Review started, still waiting for missing P&ID's about *External Supplier's System*	Sign.	SSK	17/04/2024	4	1
						QC				
Deferred	Lab Setup	Set TimeSync for all OS's	Instructions for setup found in C:\Misc\TimeSync, and on the Intranet	To make sure alarms on all OS's are synchronised, and that SPM data export functions correctly	OS21 not available yet	Sign.	XXX	07/05/2024	2	2
						QC				
Not Started	Backup	Backup CB Project folder	First verify that if the Control Builder project can go online. Also check for additional files in Compact Control Builer AC 800M\Libraries Link to guideline section	Internal routines on ensuring quality within our projects (link)		Sign.			6	3
						QC				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Project Management
Project Process
Logistics
Software
Hardware
Production
Intranet > Knowledge Page > Software
Control Builder
GMR
Gensheets
Company Software
Microsoft Office
Other Tools
Intranet > Knowledge Page > Software > Control Builder
Updating Control Builder
Creating a New Project
Creating a Program
Descriptive Text
Intranet > Knowledge Page > Software > Control Builder > Creating a Program
Creating a Program
Contents
Section 1
Section 2
Section 3
Section 4
Section 5
Description
Start
Task
Task
Section 1: Lorem ipsum dolor sit amet, consectetur adipiscing

Conclusions

Key Challenges Identified
Inefficiencies and conflicts were found in PM/KM documentation, communication, and knowledge sharing, to some extent conflicts correlates with seniority.

Developed Solutions
Tailored guidelines and checksheets were developed and tested and got positive feedback by staff.

Impact and Outcomes
The tools shows potential to improve clarity while reducing information loss.

Recommendations & Outlook
Continued refinement, scaling, digital integration, and training will continue for long-term impact.

What happend?

The initial framework
The database set up has continued to be used and populated (July 2025)

The Checksheets
Have not been further worked on, but the potential remains but has been difficult to prioritse.

Knowledge Management is not easy.

Knowledge evolves and requires constant maintenance. (can not be done once and left alone)