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SharePoint-based digital infrastructure in an oil service company

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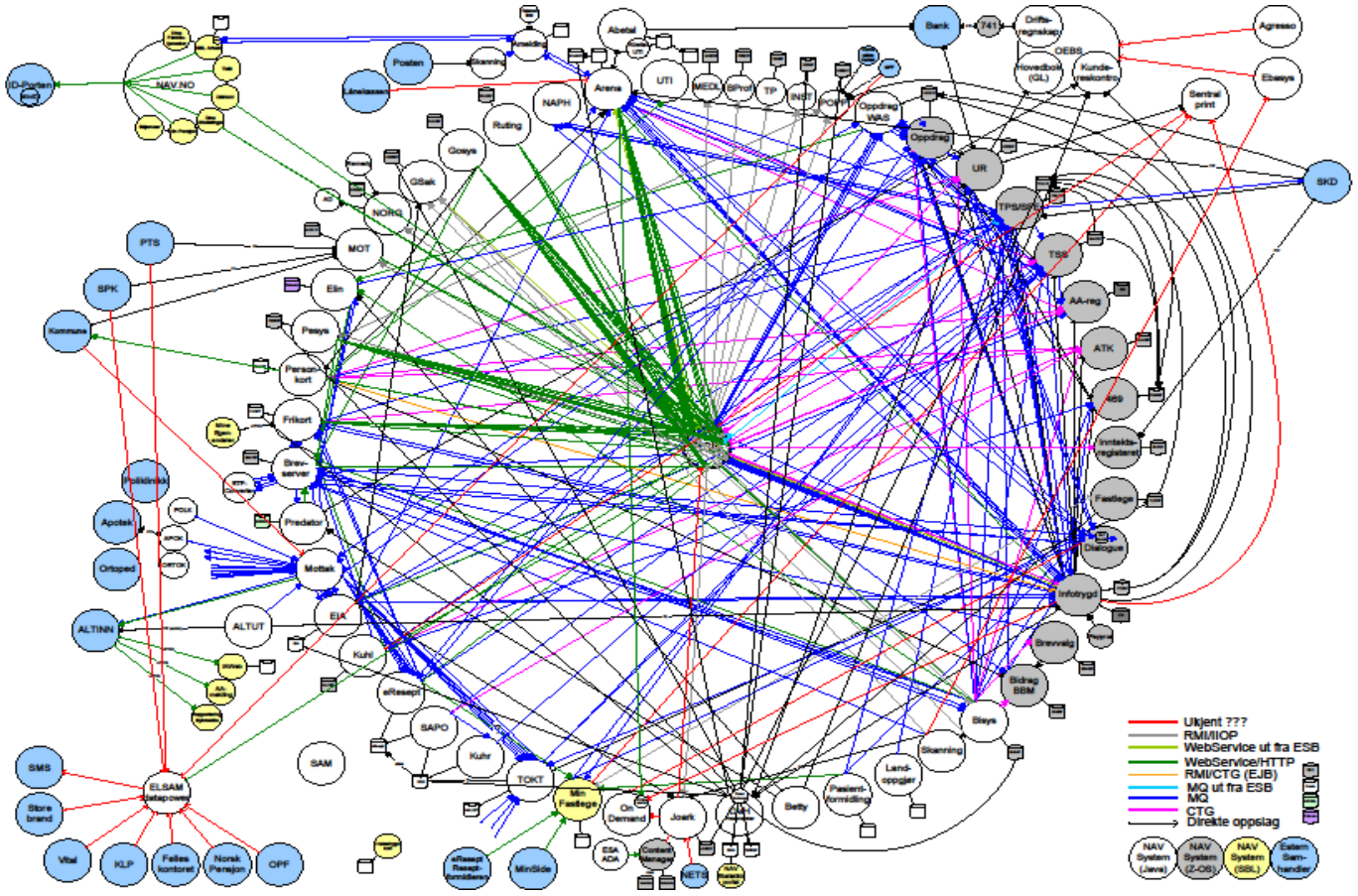
Overview

- Theory
  - Installed base cultivation
  - Understanding digital infrastructures in the making as ‘combinatorial evolution’
- Case
  - Bergen Drilling
  - Ambidextrous cultivation: structural deepening and redomaining
- Some implications

Complexity of information infrastructures

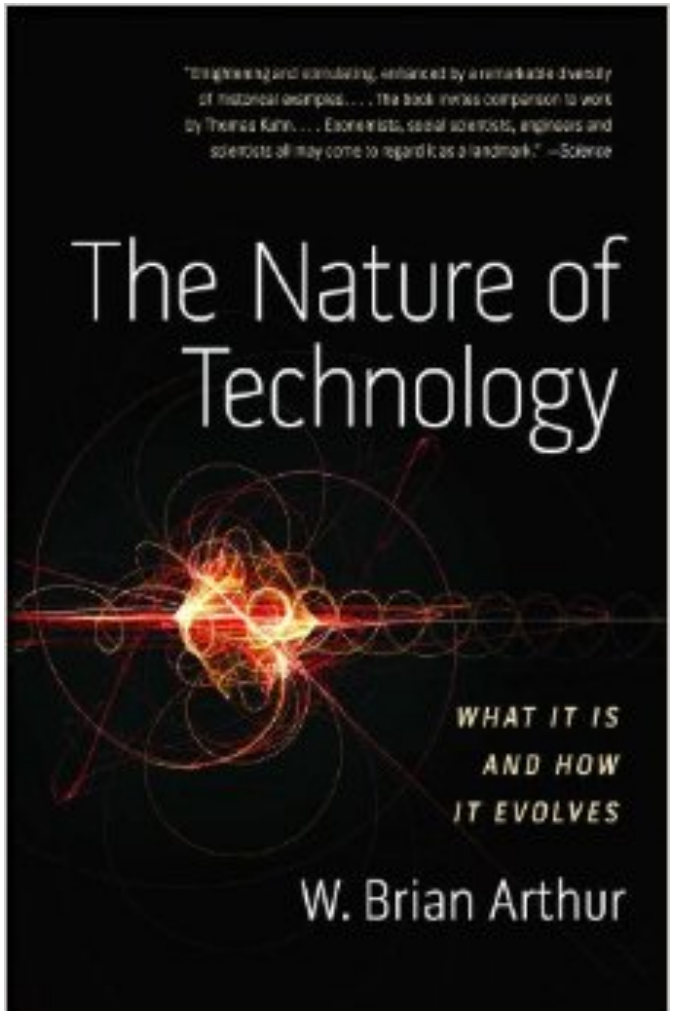


Installed base cultivation

- The metaphor of cultivation to describe how an information infrastructure evolves
- Builds on an installed base (i.e. what is already there)
- More bottom-up than top-down
- Incremental extensions rather than substitutions and/or radical re-arrangements
- Never in full control, but not totally unpredictable either
- Examples in the literature: Aanestad and Jensen (2011); Ciborra et al. (2000); Grisot et al. (2014); Rolland (2000)

The nature of technology – Arthur (2009)

- Technology is not the same as knowledge. Technology as an assemblage of practices and components.
- “Technology creates itself out of itself” (p.21)



Combinatorial evolution

- Definition: Novel technologies do not come into existence from nothing, but are always a combination of existing assemblies. Hence, technologies evolve through combination of existing assemblies. Novel technologies are based on a basic principle that is grounded in either human or technological needs.

- Implications for II: The basic mechanism through which an installed base is cultivated. Cultivation involves a successful combination of an assembly or subassembly of the existing installed base with external assemblies (or subassemblies) not initially part of the installed base. Cultivation of novel functionalities can be based on either human or technological needs. For example, a user need can be “finding the right documents” and the technological need can be functionality for indexing all documents on fileservers.

Structural deepening

- Definition: Structural deepening refers to the process of adding assemblies to work around current limitations of a technology. Technologies elaborate and become more complex (i.e. their structure is deepening) as they evolve.

- Implications for II: The process of structural deepening involves adding assemblies on top of an existing installed base do that its functionality is extended and/or modified in order to (a) enhance performance, (b) be used across different context and situations, (c) adapt to a wider range of users and tasks, (d) enhance safety and/or reliability. Failure to deepening the structures of an existing installed base can imply a failure of the current II. For example, the failure to add a module for improving search functionality could stop the evolution of an II if this is not achieved (users could adopt different IIs that has better search functionality).

- Extensions in terms of functionality or APPs – but also new structures for digital content.

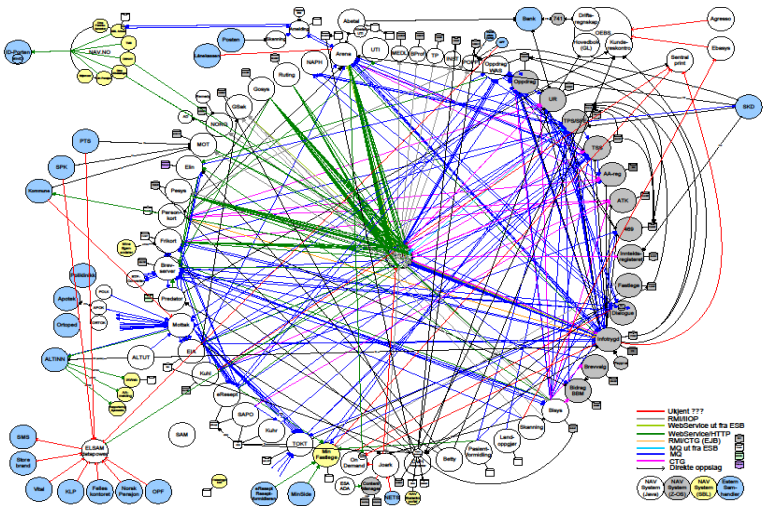
Redomaining

- Definition: Redomianing refers to the process of establishing new coherent families of technologies.

- Implications for II: A redomaining involve a large-scale replacement or change in the main assemblies of an installed base such as major shifts in standards, architectures and functionalities. For example, implementing a new version of Microsoft SharePoint software platform or establishing a SOA architecture could imply redomaining.

Redomaining: re-organizing architectures

- Not necessarily IT-systems and new functionality *per se* but re-organizing of existing architecture
- More radical change than structural deepening
- Important for the qualities of an information infrastructure: e.g. scaling, maintainability and interoperability
- Difference between function and form (Kallinikos, 2012).



Importance of digital contents

- Digital technologies also typically have content and meta-content e.g. an empty database is not the same as an database with 1 million rows of data and additional meta-data.
- Database designs tend to ‘wear out’ and appear less structured over time - e.g. users tend to re-invent the meaning of attributes– see Rolland and Monteiro (2002)
- Digital content is made interpretable and usable through standards (pdf, docx, tiff etc.)
- Digital content is often a main reason for path-dependencies and lock-in of certain solutions (Rolland, 2000)
- Meta-data implies taxonomies for ‘sorting out’ and interpreting data.
- Especially important when discussing information infrastructures in organizations – e.g. SharePoint is designed especially for Microsoft type of content.

Case: “Bergen Drilling”

- Global company – sells drilling services and products
- HQ in Bergen Norway, but offices in 11 countries all over the world

Basic characteristics

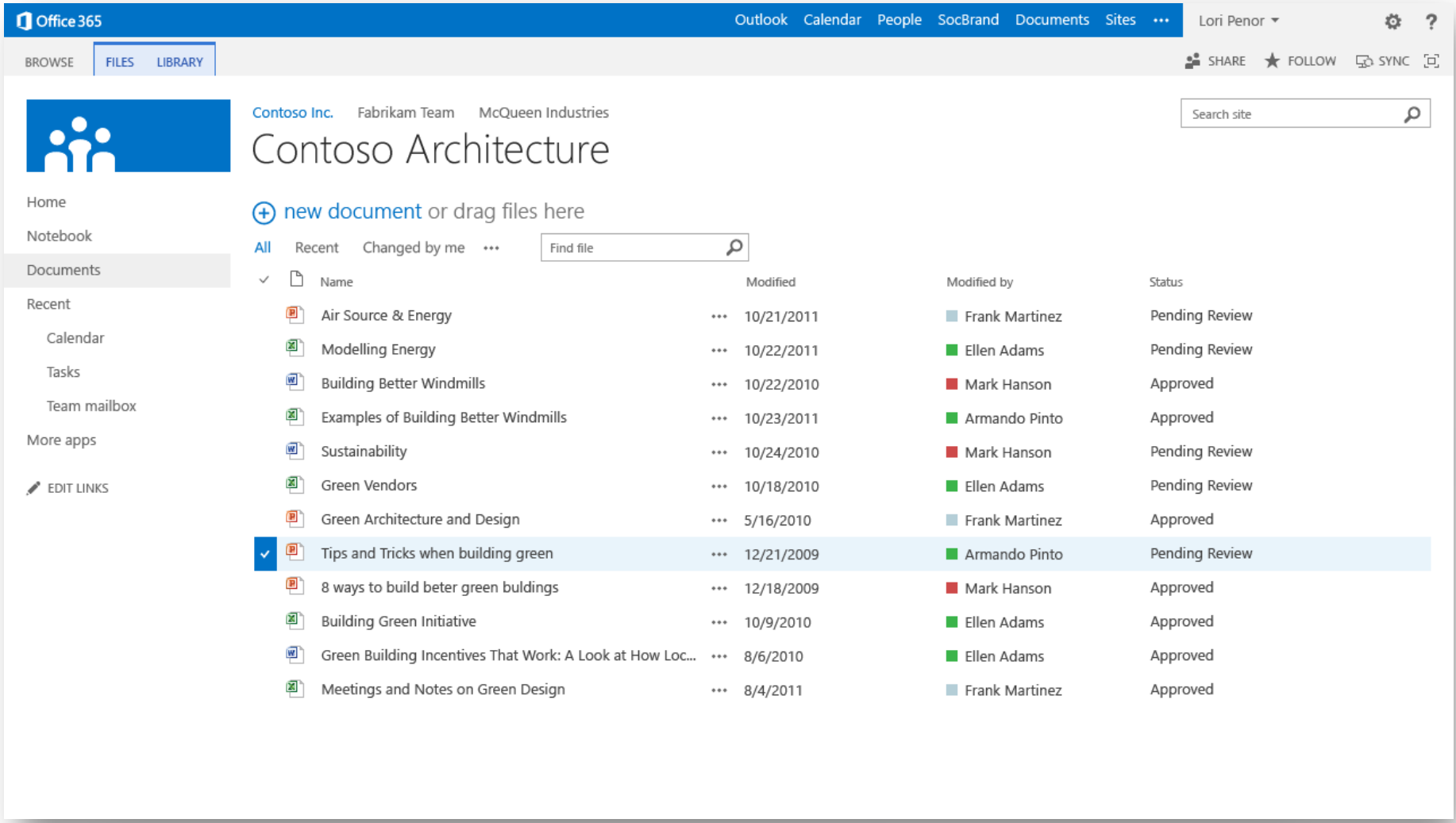
- Frequent transformations and turbulent environment
- Criticality of work conducted
- An “entrepreneurial culture”: “We improvise and just fix things”
- Increasingly complex products and services: from temporary equipment to permanent equipment.

Longitudinal case study

- Studying the evolution of an information infrastructure largely based on various versions of Microsoft SharePoint software platform (2007, 2010, 2013)
- Case study focusing on the period from 2009 ->
- In-depth interviews, observation and various workshops.

Innovation through Microsoft SharePoint

- Increasing need for global collaboration
- Substitute existing document management systems (DocuShare, PDM and file servers)
- Implement more standardized routines for documents in projects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McQueen Industries
Search site
Contoso Architecture
Home
Notebook
Documents
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More apps
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Air Source & Energy 10/21/2011 Frank Martinez Pending Review
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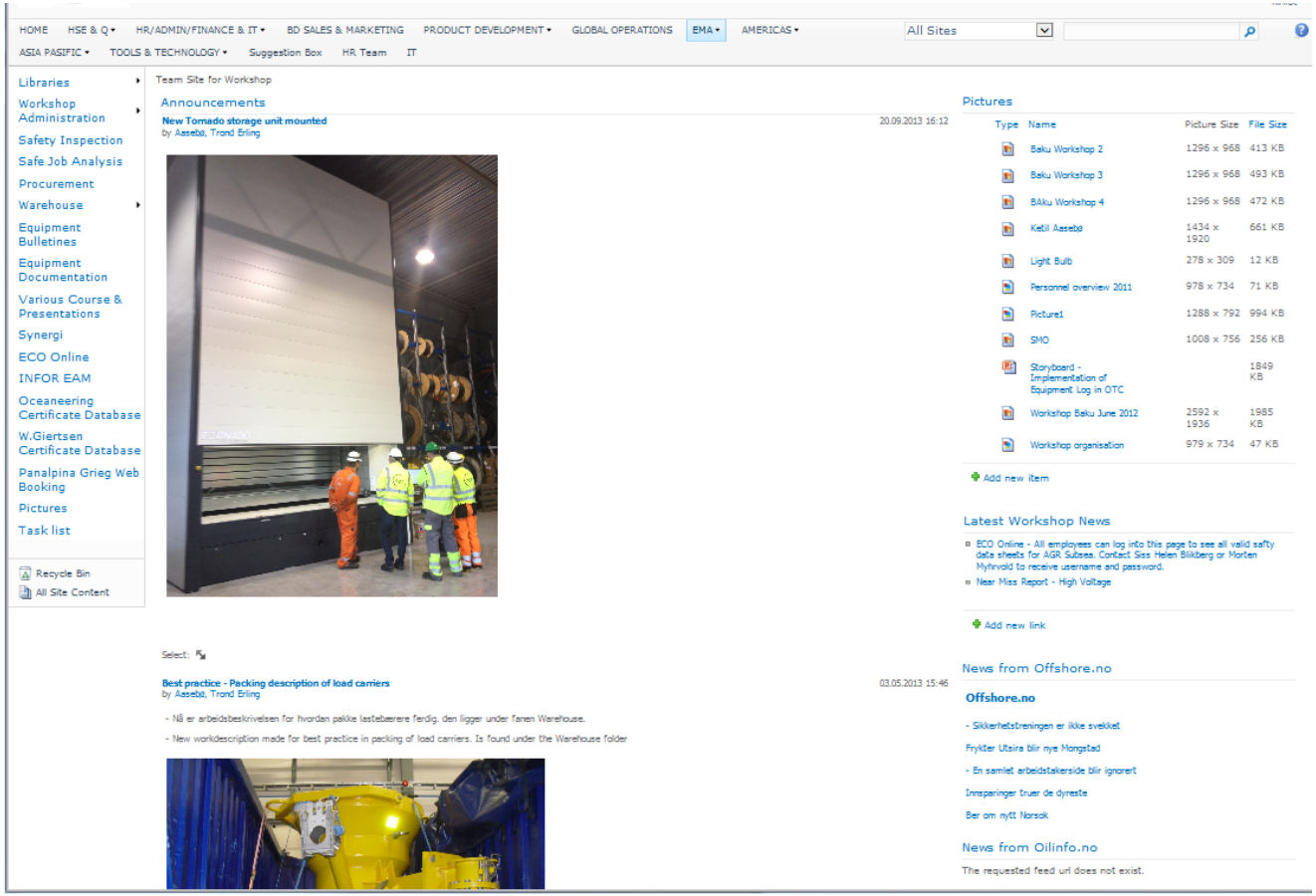
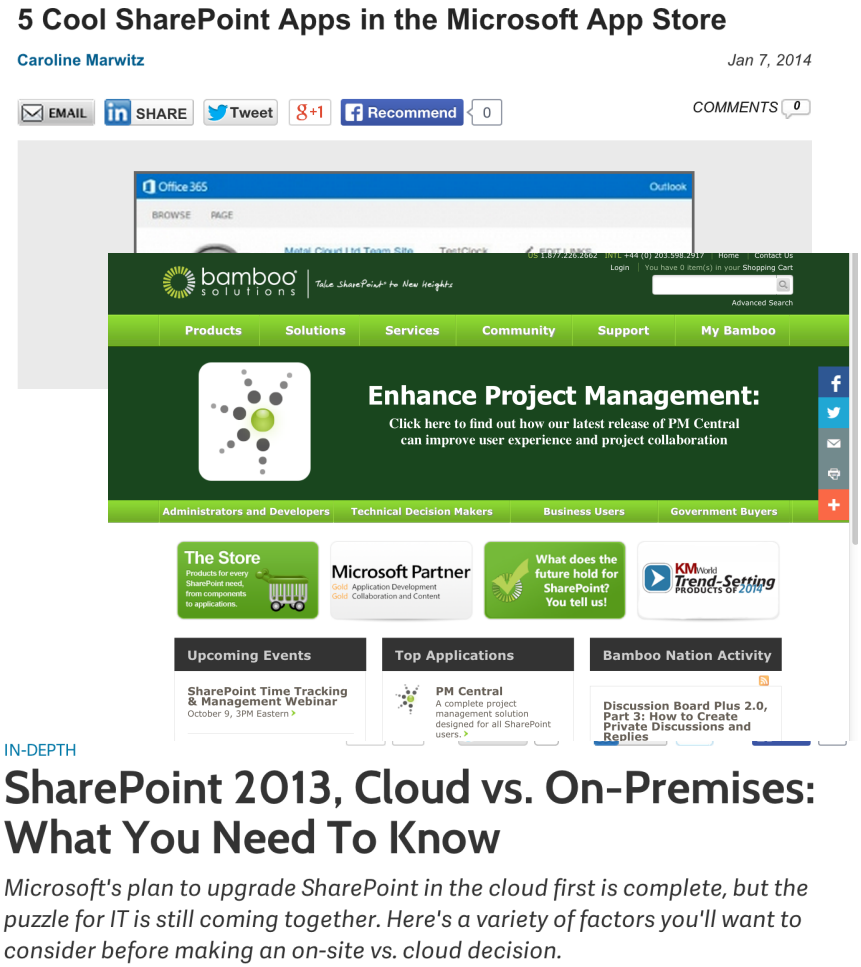
Simple tailoring of Microsoft SharePoint 2010



SharePoint as a software platform

- Lots of **third-party modules** and companies that develop APPs on top of SharePoint. Example: Bamboo
- **No clear roadmap** – Microsoft are constantly buying up companies that have developed too popular APPs. Example: yammer.com
- Increasing complexity of the software platform – gone **through several foundational architectural changes** over the years
- Also **consultants** and the **Office package**
- **The Cloud** vs '**On-Premises**'



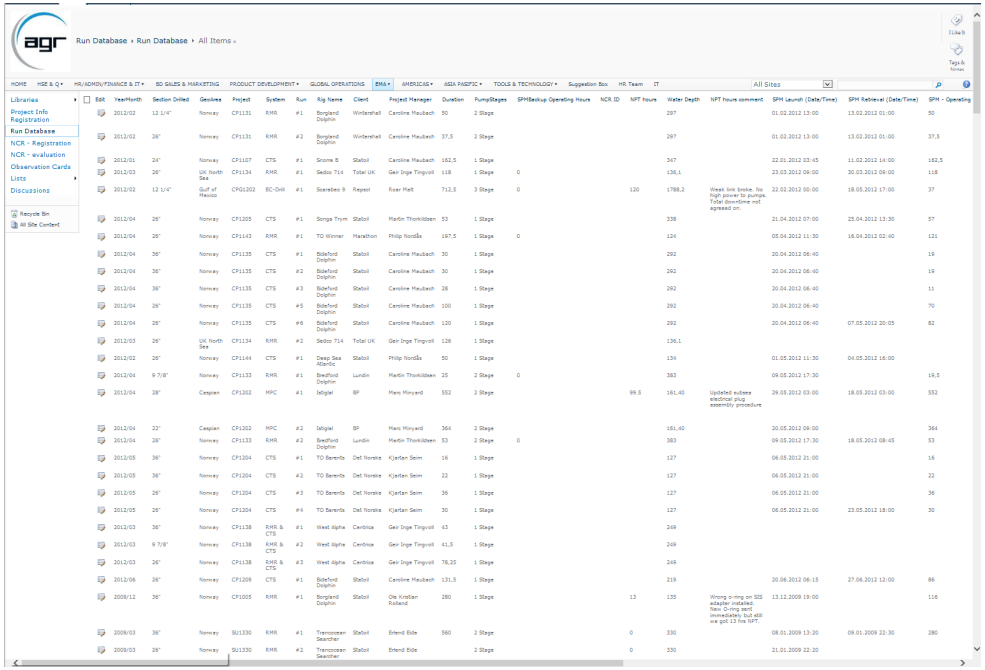
More work than initially assumed

- [The consultant] was keen on following the out-of-the-box strategy, which was the hype of time. In other words, the focus was on doing as little as possible – basically install the software. And our focus was to get this over with as quickly as possible. ***So the idea was to do as little as possible customization***. You have to understand that management wanted as much as possible from the money they spent on the project. In addition, we did not have a lot of competence in the organization on SharePoint, so we did not want it to become too complex to maintain and upgrade over time. ***But he [the consultant] stayed with us for nine months***… (IT director)

Ambidextrous cultivation

- Cultivation takes two distinct forms in relation to the SharePoint software platform. Both forms equally important.
- Extending (structural deepening):
  - A learning-by-trying process (Fleck, 1994) in order to find the best combination and extending the SharePoint IS with new APPs both third party and in-house developed.
- Redomaining:
  - Many unplanned and local changes in the surrounding network of components and connectors
  - Also new meta taxonomies for digital content – partly because of SharePoint
  - Trying to *work around* past architectural designs and decisions – but simple replacements will not do the trick

Extending: ‘well operations analysis APP’



- New APPs added on top of existing infrastructure.
- Typically does not change the wider architecture
- Important for mobilizing actors and ‘harmonizing’ work practices over time

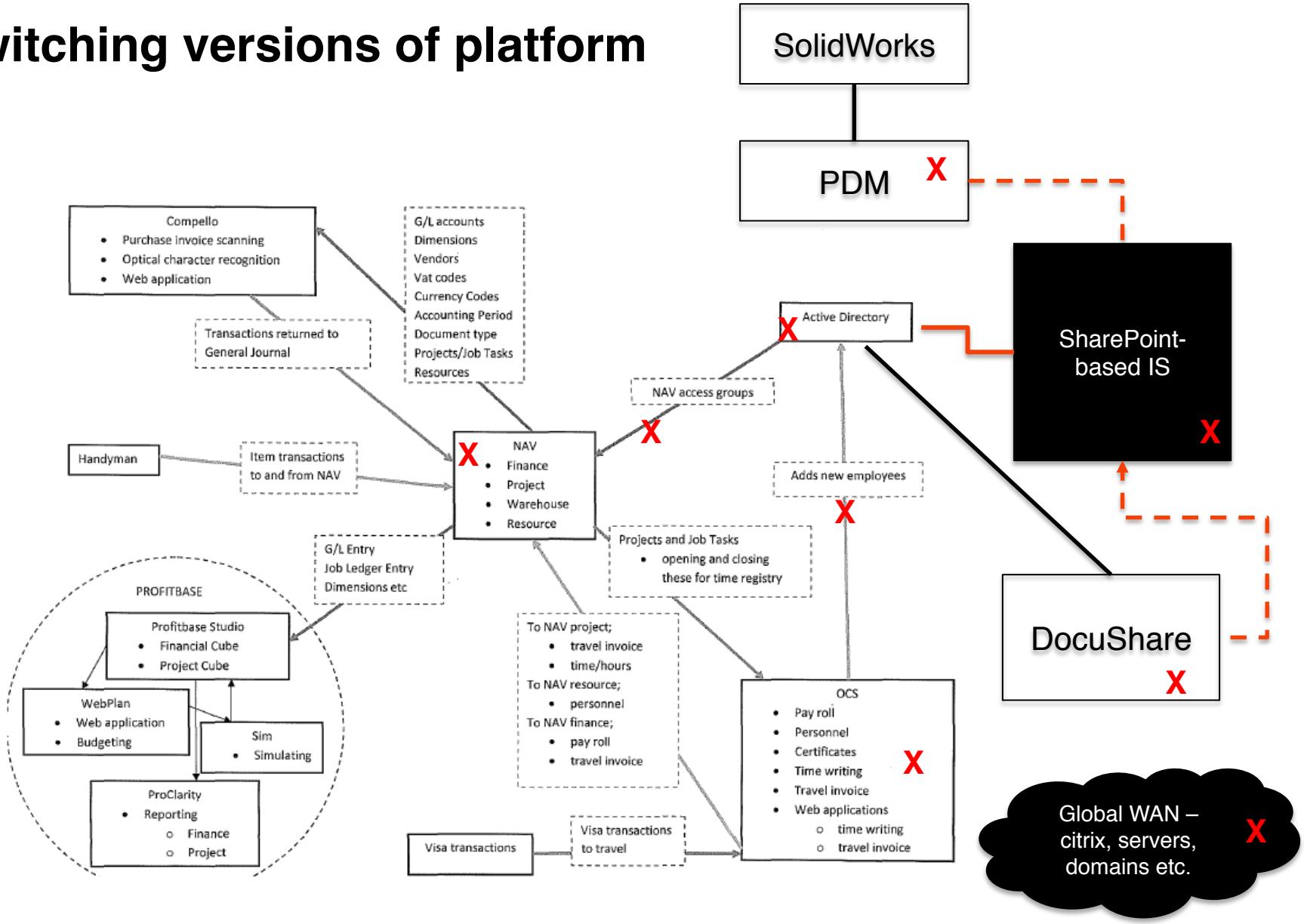
Combining and extending

- A form of cultivation was focused on utilizing the resources provided by the software platform in order to provide new functionality.

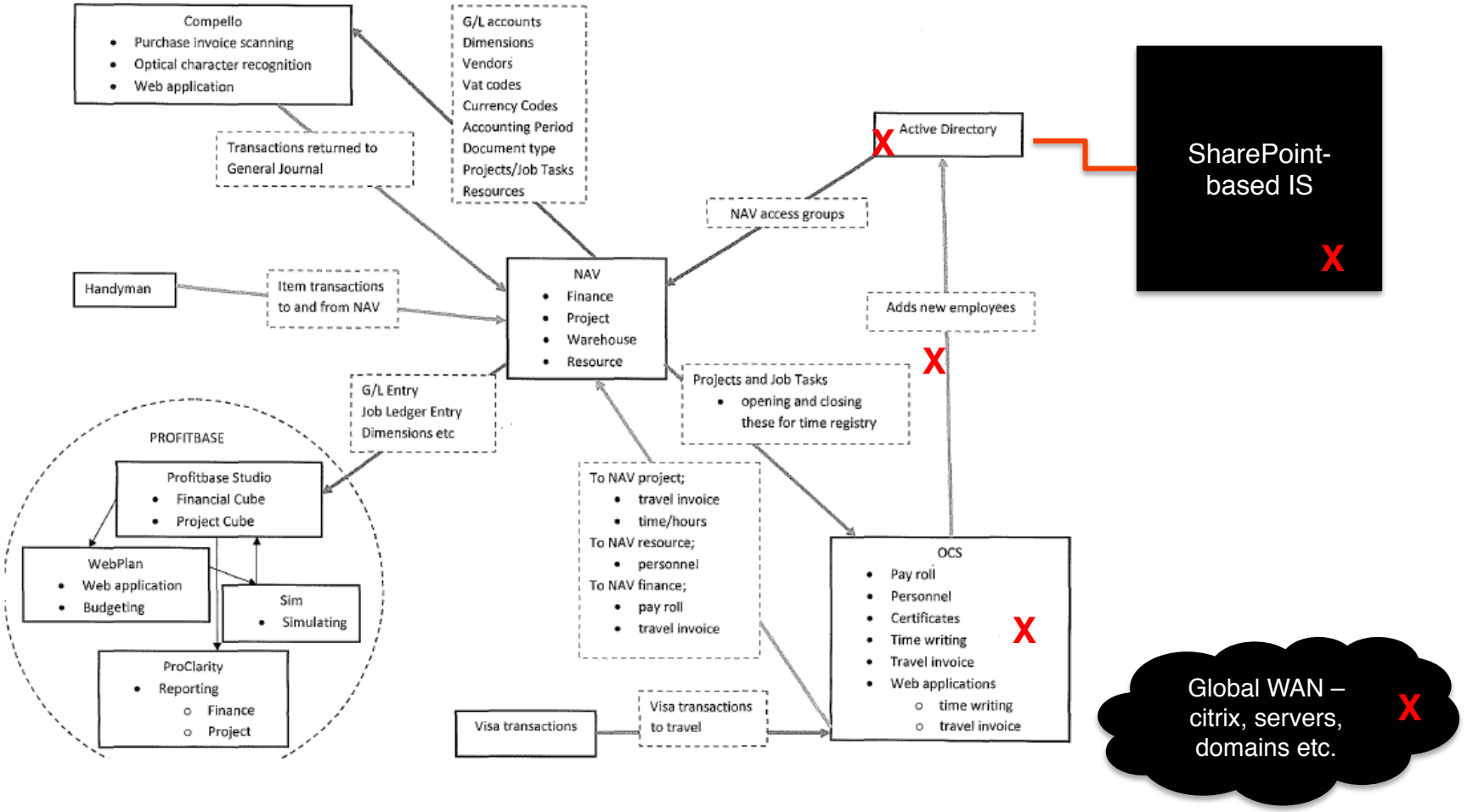
- Examples:
  - The APP for overlooking well operation
  - A dashboard APP for top management
  - Workflows for documentation management
  - An APP for CRM in the planning

- Consequences
  - New APPs added on top of existing infrastructure.
  - Typically does not change the wider architecture.
  - Important for mobilizing actors and ‘harmonizing’ work practices over time

Switching versions of platform

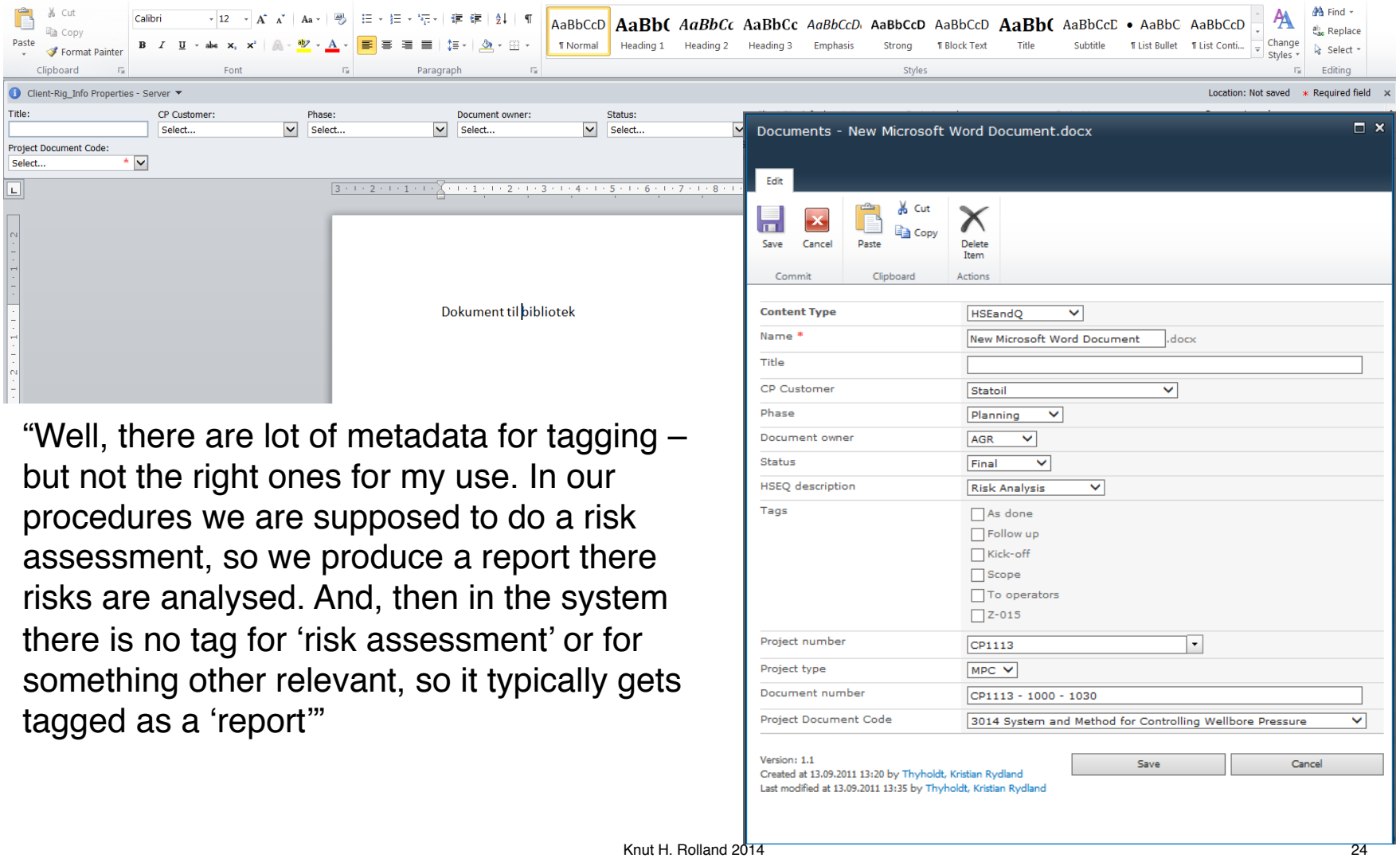


Similar changes triggered by re-organizing



X == 'fixing the past'

Re-Categorizing digital content



"Well, there are lot of metadata for tagging – but not the right ones for my use. In our procedures we are supposed to do a risk assessment, so we produce a report there risks are analysed. And, then in the system there is no tag for 'risk assessment' or for something other relevant, so it typically gets tagged as a 'report'"

Cultivating *function – structural deepening*

- Extending functionality on top of SharePoint does not necessarily imply new architecture (cf. Kallinikos (2012).
- The ‘same’ functionality can be provided by different forms (cf. Yoo, Henfridsson & Lyytinen, 2010)
- But, new modular extensions on top of existing architecture tend to produce path-dependency when institutionalized in users’ work practices.
- Less radical than redomaining

Cultivating architecture – *redomaining*

- Redomaining in the sense that existing architecture of the installed base is re-organized.
- Not necessarily want to substitute existing systems - but re-organize how they work together as a whole.
- Much IS research is focused on functionality and its enactment in practice - e.g. studies of ERP focuses often on tailoring of functionality) – but this cannot explain this dynamics
- 'Misalignment' is not only in the dimension of functionality but also between conflicting architectures
- The architecture of IS – in terms of the structure of different components and connectors as well as various meta-structures for digital content is under-theorized

Hard to mobilize for redomaining

"I know how much work that lays behind – but it is very difficult to explain why we have spent this much time. IT has gotten a bad reputation. Information architecture and IT architecture is highly abstract – not easy to understand and demonstrate"

(IT director)

Digital architectures are different

- Architecture is more abstract, requires knowledge of the existing architecture and interconnections.

  > “The architecture of implemented software systems simply does not exist in the same manner as traditional built systems. The abstract concepts of building architecture can be ‘seen’ in the physical realisation of the system… “ (Baragry and Reed (1998: pp. 3).

- Always multiple architectures: software modules, digital content, meta data, dynamic vs. static

A ‘cyclic’ process ?

- Redomaining is needed in order to combine with new versions of the SharePoint software platform
  - Often outside the scope of the project -> need to mobilize different stakeholders
  - Takes more time, more complex than stakeholders expect

- The potential for structural deepening is larger in modularized and ‘rich’ architectures
  - Access to third party components
  - Possibilities for combining digital information and services