



**Westerdals**

Oslo School of Arts,  
Communication and Technology

# **SharePoint-based digital infrastructure in an oil service company**

**Knut H. Rolland**



# Overview

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

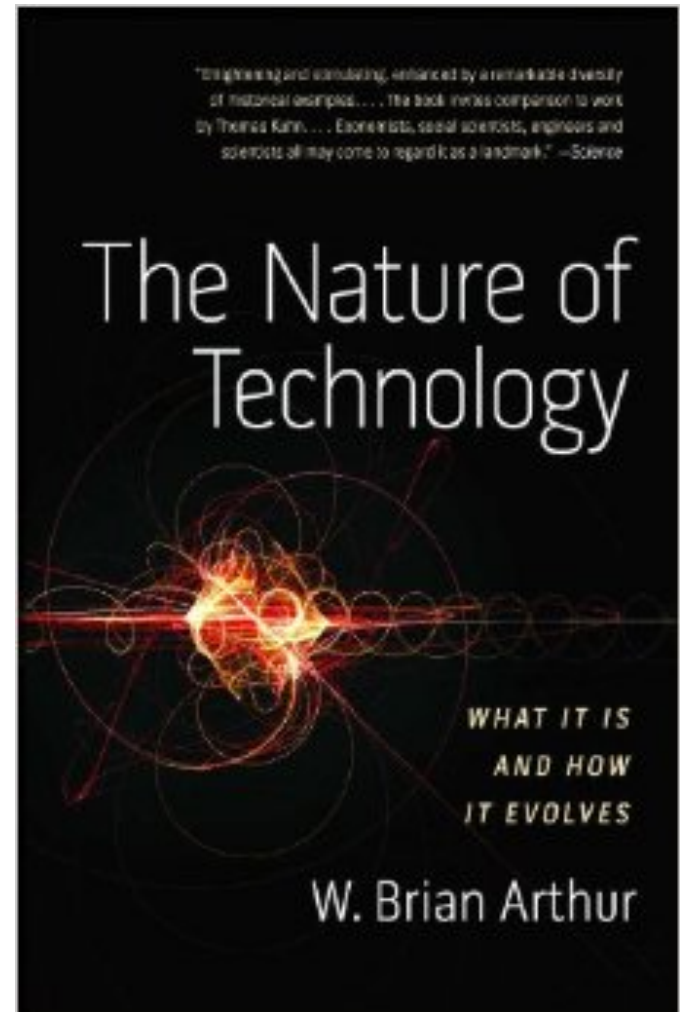


# Installed base cultivation

- 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 file servers.

# 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 so 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 deepen 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.

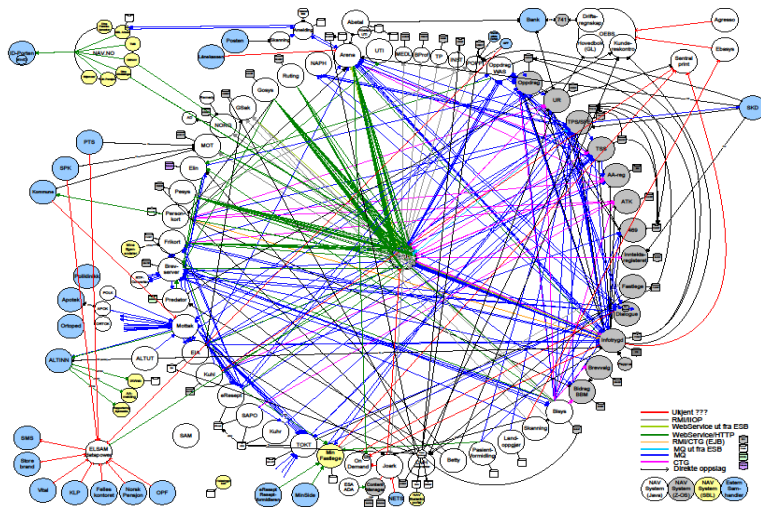
# Redomaining

- 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).

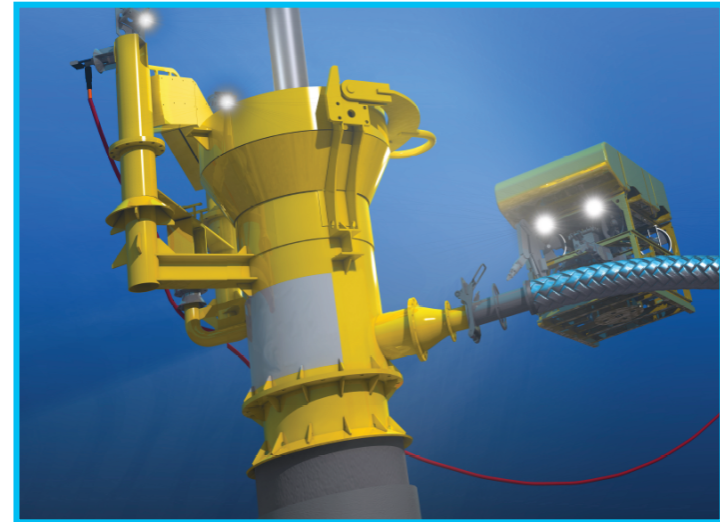


# Importance of digital contents

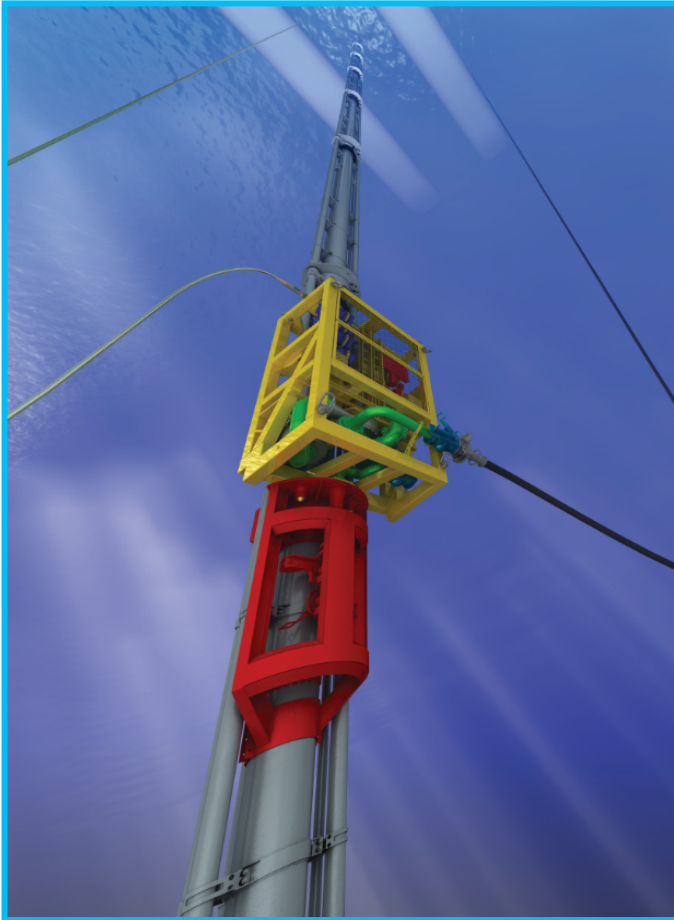
- Digital technologies also typically have content and meta-content e.g. an empty database is not the same as an database with 1 million rows of data and additional meta-data.
- Database designs tend to ‘wear out’ and appear less structured over time - e.g. users tend to re-invent the meaning of attributes– 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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Contoso Inc. Fabrikam Team McQueen Industries

## Contoso Architecture

Search site 🔍

Home

Notebook

Documents

Recent

Calendar

Tasks

Team mailbox

More apps

✎ EDIT LINKS

new document or drag files here

All Recent Changed by me ...

Find file 🔍

✓	Name	Modified	Modified by	Status
	Air Source & Energy	... 10/21/2011	Frank Martinez	Pending Review
	Modelling Energy	... 10/22/2011	Ellen Adams	Pending Review
	Building Better Windmills	... 10/22/2010	Mark Hanson	Approved
	Examples of Building Better Windmills	... 10/23/2011	Armando Pinto	Approved
	Sustainability	... 10/24/2010	Mark Hanson	Pending Review
	Green Vendors	... 10/18/2010	Ellen Adams	Pending Review
	Green Architecture and Design	... 5/16/2010	Frank Martinez	Approved
✓	Tips and Tricks when building green	... 12/21/2009	Armando Pinto	Pending Review
	8 ways to build beter green buldings	... 12/18/2009	Mark Hanson	Approved
	Building Green Initiative	... 10/9/2010	Ellen Adams	Approved
	Green Building Incentives That Work: A Look at How Loc...	... 8/6/2010	Ellen Adams	Approved
	Meetings and Notes on Green Design	... 8/4/2011	Frank Martinez	Approved

# Simple tailoring of Microsoft SharePoint 2010

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Libraries

- Workshop
- Administration
- Safety Inspection
- Safe Job Analysis
- Procurement
- Warehouse
- Equipment
- Bulletines
- Equipment Documentation
- Various Course & Presentations
- Synergi
- ECO Online
- INFOR EAM
- Oceaneering Certificate Database
- W.Giertsen Certificate Database
- Panalpina Grieg Web Booking
- Pictures
- Task list

Recycle Bin


All Site Content

Team Site for Workshop

Announcements

**New Tomado storage unit mounted**  
by Aasebø, Trond Erling

20.09.2013 16:12



Pictures

Type	Name	Picture Size	File Size
	Baku Workshop 2	1296 x 968	413 KB
	Baku Workshop 3	1296 x 968	493 KB
	Baku Workshop 4	1296 x 968	472 KB
	Kell Aasebo	1434 x 1920	661 KB
	Light Bulb	278 x 309	12 KB
	Personnel overview 2011	978 x 734	71 KB
	Picture1	1288 x 792	994 KB
	SMD	1008 x 756	256 KB
	Storyboard - Implementation of Equipment Log in OTC		1849 KB
	Workshop Baku June 2012	2592 x 1936	1985 KB
	Workshop organisation	979 x 734	47 KB

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Latest Workshop News

- ECO Online - All employees can log into this page to see all valid safety data sheets for AIGR Subsea. Contact Site Helen Skilleberg or Marlon Myrinvold to receive username and password.
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- En samlet arbeidstakerside blir ignorert
- Innsparinger truer de dyreste
- Ber om nytt Norsk

News from Oilinfo.no


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**Best practice - Packing description of load carriers**  
by Aasebø, Trond Erling

03.05.2013 15:46

- Nå er arbeidsbeskrivelsen for hvordan pakke lastebærere ferdig, den ligger under fanen Warehouse.
- New workdescription made for best practice in packing of load carriers. Is found under the Warehouse folder





# 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’**

## 5 Cool SharePoint Apps in the Microsoft App Store

Caroline Marwitz

Jan 7, 2014

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The screenshot shows the Bamboo Solutions website, which is a SharePoint application. The page has a green header with the company logo and navigation menu. The main content area features a large banner for 'Enhance Project Management' with a call to action. Below the banner are several promotional tiles, including 'The Store', 'Microsoft Partner', 'What does the future hold for SharePoint?', and 'KM World Trend-Setting Products of 2014'. At the bottom, there are sections for 'Upcoming Events', 'Top Applications', and 'Bamboo Nation Activity'.

IN-DEPTH

## SharePoint 2013, Cloud vs. On-Premises: What You Need To Know

*Microsoft's plan to upgrade SharePoint in the cloud first is complete, but the puzzle for IT is still coming together. Here's a variety of factors you'll want to consider before making an on-site vs. cloud decision.*

# 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'

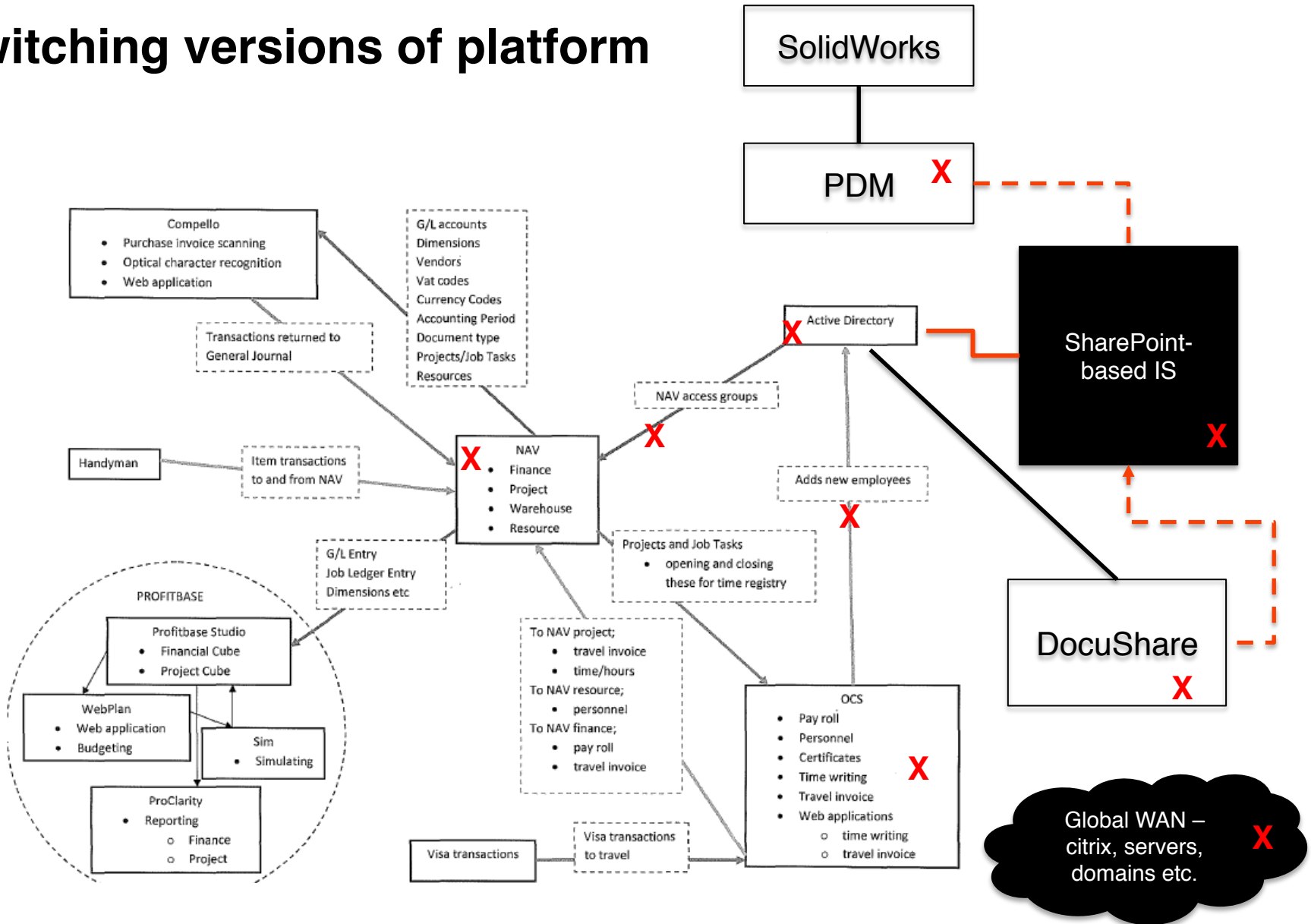
YearMonth	Section	Well	System	Run	Client	Project Manager	Duration	Pump/Stage	SPH/Backup	Operating Hour	NCR ID	NPT Hour	Water Depth	NPT Hour comment	SPH Launch (Date/Time)	SPH Setback (Date/Time)	SPH - Operating
2012-02	12 U4"	Norway	CF1131	RMS	#1	Borgard Design	Winderhal	Caroline Haulbech	50	2 Stage		297			01.02.2012 13:00	13.02.2012 01:00	50
2012-03	36"	Norway	CF1131	RMS	#3	Borgard Design	Winderhal	Caroline Haulbech	37.5	2 Stage		297			01.02.2012 13:00	13.02.2012 01:00	37.5
2012-01	24"	Norway	CF1107	CTS	#1	Storø B	Stalot	Caroline Haulbech	162.5	1 Stage		347			22.01.2012 03:05	11.02.2012 14:00	162.5
2012-03	36"	UK North Sea	CF1134	RMS	#1	Section 714	Total UK	Gier Dige Tingsvoll	118	1 Stage		136.1			23.03.2012 09:00	30.03.2012 09:00	118
2012-02	12 U4"	Gulf of Mexico	CF8102	BC-DW	#1	Storøen B	Rappert	River Mart	732.5	3 Stage		130	1788.2	Water link broken. No flow record for pumpage. 1788.2 comment not entered on	22.02.2012 00:00	18.05.2012 17:00	37
2012-04	36"	Norway	CF1203	CTS	#1	Storøen Torm	Stalot	Heden Thorsleben	53	1 Stage		338			21.04.2012 07:00	23.04.2012 13:30	37
2012-04	36"	Norway	CF1143	RMS	#1	TO Winner	Havthorn	Philip Nordla	197.5	1 Stage		124			05.04.2012 11:30	16.04.2012 02:40	121
2012-04	36"	Norway	CF1135	CTS	#1	Bakfud Design	Stalot	Caroline Haulbech	30	1 Stage		292			20.04.2012 06:40		19
2012-04	36"	Norway	CF1135	CTS	#2	Bakfud Design	Stalot	Caroline Haulbech	30	1 Stage		292			20.04.2012 06:40		19
2012-04	36"	Norway	CF1135	CTS	#3	Bakfud Design	Stalot	Caroline Haulbech	28	1 Stage		292			20.04.2012 06:40		11
2012-04	36"	Norway	CF1135	CTS	#4	Bakfud Design	Stalot	Caroline Haulbech	100	1 Stage		292			20.04.2012 06:40		70
2012-04	36"	Norway	CF1135	CTS	#5	Bakfud Design	Stalot	Caroline Haulbech	100	1 Stage		292			20.04.2012 06:40	07.05.2012 20:05	82
2012-03	24"	UK North Sea	CF1134	RMS	#2	Section 714	Total UK	Gier Dige Tingsvoll	128	1 Stage		136.1					
2012-02	36"	Norway	CF1144	CTS	#1	Deep Sea Atlantic	Stalot	Philip Nordla	50	1 Stage		134			01.05.2012 11:30	04.05.2012 16:00	
2012-04	9 7/8"	Norway	CF1133	RMS	#1	Borgard Design	Lundin	Heden Thorsleben	25	2 Stage		383			08.05.2012 17:30		118.8
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2012-04	22"	Capitan	CF1202	HPC	#2	Selvig	BP	Hans Hovstad	264	2 Stage			161.40		20.05.2012 09:00		264
2012-04	36"	Norway	CF1133	RMS	#3	Borgard Design	Lundin	Heden Thorsleben	53	2 Stage		383			08.05.2012 17:30	18.05.2012 03:00	53
2012-05	36"	Norway	CF1204	CTS	#1	TO Berents	Del Norske	Kjarfær Sem	16	1 Stage		127			06.05.2012 21:00		16
2012-05	36"	Norway	CF1204	CTS	#2	TO Berents	Del Norske	Kjarfær Sem	32	1 Stage		127			06.05.2012 21:00		22
2012-05	36"	Norway	CF1204	CTS	#3	TO Berents	Del Norske	Kjarfær Sem	36	1 Stage		127			06.05.2012 21:00		26
2012-05	36"	Norway	CF1204	CTS	#4	TO Berents	Del Norske	Kjarfær Sem	30	1 Stage		127			06.05.2012 21:00	23.05.2012 18:00	30
2012-03	36"	Norway	CF1138	RMS & CTS	#1	Wael Alpha	Candrosa	Gier Dige Tingsvoll	43	1 Stage		249					
2012-03	9 7/8"	Norway	CF1138	RMS & CTS	#2	Wael Alpha	Candrosa	Gier Dige Tingsvoll	41.5	1 Stage		249					
2012-03	26"	Norway	CF1138	RMS & CTS	#3	Wael Alpha	Candrosa	Gier Dige Tingsvoll	76.25	1 Stage		249					
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2009-12	36"	Norway	CF1005	RMS	#1	Borgard Design	Stalot	Die Kristjan Ruland	280	1 Stage		13	135	Wrong pump on SIS valve installed. New 2-yrng seal installed. See app we get 13 hr NPT.	13.12.2009 19:00		116
2009-03	36"	Norway	SI1230	RMS	#1	Thorsvæn Skarvæn	Stalot	Blend Side	560	2 Stage		0	330		08.01.2009 13:30	09.01.2009 20:30	280
2009-03	36"	Norway	SI1230	RMS	#2	Thorsvæn Skarvæn	Stalot	Blend Side		2 Stage		0	330		21.01.2009 22:20		

- 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

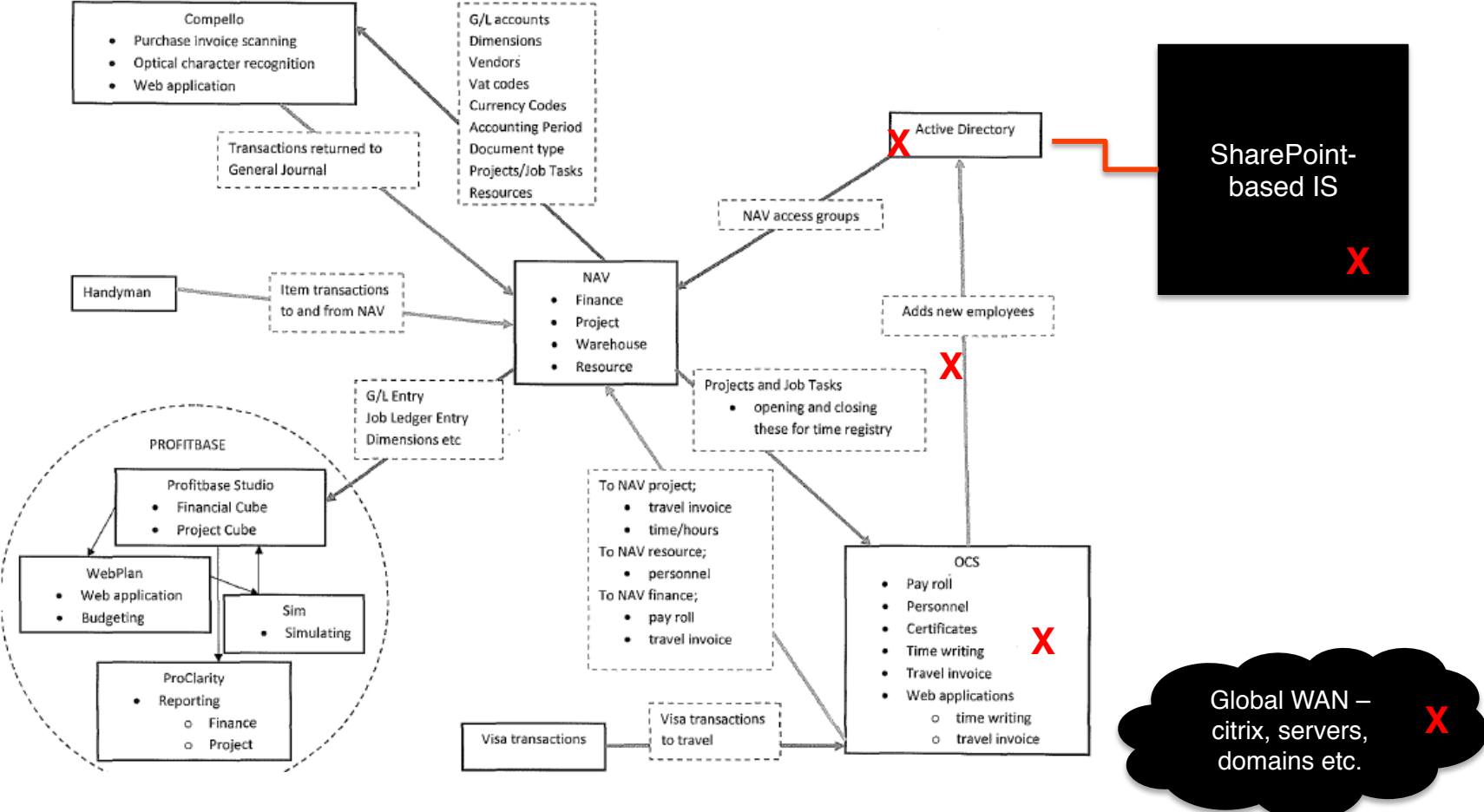
# Combining and extending

- 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



# Re-Categorizing digital content

Client-Rig\_Info Properties - Server

Document til bibliotek

Documents - New Microsoft Word Document.docx

Content Type: HSEandQ

Name: New Microsoft Word Document.docx

Title:

CP Customer: Statoil

Phase: Planning

Document owner: AGR

Status: Final

HSEQ description: Risk Analysis

Tags:  As done,  Follow up,  Kick-off,  Scope,  To operators,  Z-015

Project number: CP1113

Project type: MPC

Document number: CP1113 - 1000 - 1030

Project Document Code: 3014 System and Method for Controlling Wellbore Pressure

Version: 1.1  
Created at 13.09.2011 13:20 by Thyholdt, Kristian Rydland  
Last modified at 13.09.2011 13:35 by Thyholdt, Kristian Rydland

“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