

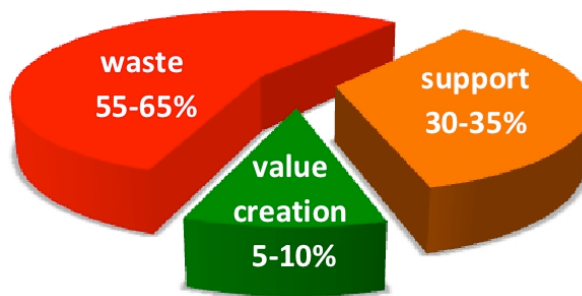
Who is making money out of waste?

(hint – waste is anything not required to create value for the customer/client/end-user/society)

A research proposal

Who will do the research? 2
 Potential outputs 3
 Dissemination 4
 Funding 4
 If you want to be part of this 5
 Who are we? 5
 References 5

It is widely accepted that there is considerable waste in the end-to-end design, construction & facility management process. Empirical evidence points to waste in excess of 50% of construction time where *waste* is defined as anything that is not required to create value for the customer/client or end-user — this is primarily *process* waste with some physical waste.



e.g.	What the customer wants	What we have to do to enable us to create what the customer wants
Accidents		
Delays, waiting		
Rework		
Over-ordered materials		e.g.
Damaged materials		Design
Multiple handling of materials		Procurement
Making do		Logistics
Multiple insurances		Taxes
Poor payment systems		
Settling disputes after PC		
Tendering		
Procuring services on cost		

Figure 1: analysis and examples of waste in construction. proportions based on studies by Diekmann *et al* 2004 for the US *Construction Users Round Table* (CURT) and unpublished studies in UK by Cameron Orr, AWD and Constructing Excellence – diagram from Mossman 2008

The fact that much of this waste is common to many projects suggests our hypothesis—that **there are structures and systems that support and encourage wasteful activities**. One obvious structure, implicit in the research question, is some sort of financial reward. There are other structures that

Who is making money out of waste in construction?

can lead to waste too, for example commercial structures (contractual arrangements) and legal structures designed to *prevent* individual stakeholders making a financial gain,

So the purpose of the research is to look at the end-to-end design, construction and maintenance process and ask at every stage:

- *What is being done that creates no value for the customer/client/end-user?*
- *Why do we do those things?*
- *Who benefits (if anyone)—and how?*

Who will do the research?

We would like to work with a number of research teams drawn from across Europe – initially we are looking for one academic research partner in each country. There is more below.

As local construction cultures differ across Europe we imagine that, while there may be many similarities across the EU, there will be differences. By reviewing each-others' work across cultures we will see and understand things that we are unlikely to see if we only look at projects in our own culture.

The intention is for the participating research teams to review a range of projects – housing, commercial, healthcare, infrastructure, engineering, education, etc. – and to produce both national and European level reports. Some projects will be large, others small. Some projects will be studied end-to-end, but studies could start anywhere. It will be useful if some studies do start with construction or even during construction provided the researchers are willing and able to track back to root causes that may emanate from the earliest phases of the project.

It is not the purpose of this research to offer solutions, given the differences in corporate, construction, legal and national culture no solution will fit everywhere and anyway it is important that those who are responsible for and those affected by each waste find *countermeasures* acceptable to all stakeholders. This could be an opportunity for follow on action-research at a local level.

The project will work with the first four steps of Allen C Ward's *lamda* process (Ward 2007, amplified by Kennedy *et al* 2008), derived from his observation of the way Toyota interprets Shewhart's *Plan-Do-Check-Act* cycle (Deming 1986, 88; often attributed to Deming). The relationship between *lamda* and *PDCA* are illustrated in Figure 2 and the *lamda* steps described below that.



Figure 2: *lamda* superimposed on PDCA (diagram © Alan Mossman 2009 with permission)

In a PDCA cycle the *lamda* process is done twice – once for Plan-Do and then again, after the experiment, for Check-Act. Outputs from the first *lamda* Cycle are used as the basis for evaluation

Who is making money out of waste in construction?

(looking) in the second. This will support practitioners learning to “*make decisions slowly through consensus, so that they can implement rapidly*” Liker’s Principle 13 (Liker 2004).

- Look** go see for yourself – researchers will “go see for themselves to thoroughly understand - *Genchi Genbutsu*” — Liker’s principle 12
what is the cost of the waste in terms of health, safety, environment, time quality and finance?
- Ask** use *5Why* and other processes to find root causes
who benefits from the waste? In what ways?
- Model** Model the existing process — systems dynamics might be a useful way to model the way current wasteful practice is supported and will help find new/alternative models that could address the root causes
- Discuss** Discuss (and develop) the model(s) with **all** stakeholders involved in the current process to check the validity of the model and to identify alternative models Add new models/root causes if appropriate and esp if new information comes to light.
[in the full *lamda* process this phase will also involve all who could affect a decision about appropriate countermeasure(s) or its(their) implementation (building consensus).
Deciding & planning implementation of the chosen model(s)/countermeasure(s).]
- Act** [do what has been decided]

So that knowledge gained is available to others later and to facilitate practitioner use of the outputs from the research, data for each *waste* identified will be summarised in an A3 report. Preparing A3 reports (the A3 process) will be part of the research process (as described by, for example, Sobek & Smalley 2008, Shook 2008 & Kennedy *et al* 2008). The *lamda* process fits well with the A3 process.

It seems to us that a range of academic disciplines have a role to play in this project including:

- Legal
- Insurance
- Commercial
- Accounting
- Construction management
- Logistics
- Civil engineering
- Structural engineers
- Architects
- Builders
- Building services
- Facilities Management
- Management
- Business studies
- Sociologists
- Anthropologists

Potential outputs

For clients and the industry

The study is designed to provide clarity about wasteful practices for clients, constructors and others in both public and private sectors so that they can decide what action to take to mitigate any losses they are suffering. Examples of the kinds of waste the research might provide more data on are:

- Costs of procurement on price vs procurement in other ways
- Costs of designing the production process & the building or structure together vs not
- Costs of multiple insurances vs single project insurance
- Costs of large batch design processes vs small batch design
- Costs of large zone construction processes vs small zone construction
- Costs of set based design vs linear design
- Costs of risk shedding vs risk sharing
- Costs of collaborative scheduling vs CPM scheduling
- Costs of framework agreements vs not
- Costs of relational contracts vs traditional contracts; collaboration vs disputes

For the academic community

In addition to papers in refereed journals and providing the *raison d'être* for further research funding, this project is expected to generate:

- National and international reports on who benefits from perpetuating wasteful activities in construction
- Industry guidance documents
- Interim and final reports and papers on research methods
- Reports and papers highlighting international differences in particular areas
- A number of PhDs/EngDs
- A cadre of researchers who understand how lean applies in construction by *genchi genbutsu* and have good connections as the basis for future collaborative research with the industry
- A group of construction professionals with a better understanding of the waste in their areas-of-responsibility and the tools to tackle/eliminate that waste.
- A group of clients committed to eliminating waste from the projects they procure
- A collection of research questions for further research

There may also be some new tools to help industry deliver value more effectively and efficiently

Dissemination

The results will be disseminated through post/undergrad programmes, presentations to industry and professional institutions and articles in the trade press.

While not a reliable source of valid/reliable research, this research project has the potential to offer projects for taught masters and undergraduate students that might offer valuable learning for the students and pointers to areas of waste worth further study by more experienced researchers. The project might also be a source of research questions for MPhil or MRes students.

Funding

We would like this project to be the subject of, say, a **Framework 7** bid. In the meantime we are wondering if this proposal might enable you to acquire funding from your own sources so that we can build a collaboration now that will make it easier to acquire European funding later.

For a funding bid, and to do the research, each participating institution will need the support of industry partners. This research is likely to be challenging to all stakeholders in the end-to-end built environment creation process, even governments and clients—the groups that potentially have the most to gain.

This will necessarily include Action Research. As action researchers we will change the system we are observing just by our presence and by asking the questions we do—and we will generate strong emotional reactions on occasions as we implicitly or explicitly challenge one or more stakeholders *cash cows*. In the process we may have to develop new – even collaborative – research methods.

We believe that this project has the potential to provide good research training for a range of post-graduate level researchers from a range of disciplines. If they don't already have them, the skills that they will be required to develop include:

- Understanding value from the point of view of the customer
- Mapping the value stream
- Seeing waste and understanding why it exists
- Summarising research in an A3 and using the emerging A3 as part of the research process
- Working with practitioners as *co-researchers* (Reason & Rowan 1981)

If you want to be part of this ...

We are looking to partner with Universities that have:

- Understanding of lean construction — or an understanding of lean and a willingness to apply it to construction.
- A willingness to work within an Action Research framework
- At least two industry partners willing to provide access to project(s) for research

Clients & Industry partners need to:

- Provide facilities for researchers on projects being scrutinised
- Allow/encourage/support their staff to engage with the researchers
- Be "big" enough to accept that they will be responsible for perpetuating some of the wasteful processes identified
- Be willing to talk about their relationship with the research project in academic & industry fora
- Have a University partner

Who are we?

We are the Lean Construction research team at Loughborough University UK led by Christine Pasquire (www.construct-lean.org)

If you are interested, want to discuss the proposal or want more information please contact:

Alan Mossman
Research Associate, Lean Construction Management & Target Value Design
Department of Civil and Building Engineering | Loughborough University | LE11 3TU | UK
T: +44 1453 765611 • C/M: +44 7968 485 627
a.mossman@lboro.ac.uk

References

- Deming, W Edwards (1986) *Out of the Crisis* MIT Press, Cambridge, MA, USA
- Diekmann, James E, Mark Krewedl, Joshua Balonick, Travis Stewart, and Spencer Won (2004) Application of lean manufacturing principles to construction. Construction Industry Institute Report 191
- Kennedy, Michael N, Harmon, K., Minnock, E. (2008) *Ready, Set, Dominate: Implement Toyota's Set-Based Learning for Developing Products and Nobody Can Catch You*; The OAKLEA Press; Richmond, VA, USA
- Liker, Jeffrey K (2004) *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer* McGraw-Hill Education
- Mossman, Alan (2009) Creating value: a sufficient way to eliminate waste in lean design and lean production. *Lean Construction Journal* 2009
- Reason, Peter & John Rowan eds (1981) *Human Inquiry: a sourcebook of new paradigm research*. John Wiley & Sons, Chichester
- Shook, John (2008) *Managing to Learn: Using the A3 management process to solve problems, gain agreement, mentor and lead*. Lean Enterprise Institute, Cambridge, MA, USA
- Sobek, Durward & Art Smalley (2008) *Understanding A3 Thinking* Productivity Press,
- Ward, Allen C. (2007) *Lean Product and Process Development*; The Lean Enterprise Institute; Cambridge, MA, USA