Process and IT (Editorial)

Koskela, LJ and Dave, B

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Process and IT

Lauri Koskela and Bhargav Dave

Organisations are constantly seeking new ways to improve business performance. Ever since the Information technology (IT) revolution in the late eighties and early nineties, IT is seen as the prime driver in the improvement of business activities. However, organisations taking this approach often fall prey to reorganising their business activities to suit the new IT system, which is often designed and implemented by technical experts who are not always aligned with business processes. In the classical article on the implications of new technology (Hayes & Jaikumar 1988), an example of replacing an old family car with a helicopter is given. Here the idea is that you only invest in the new helicopter if there is going to be a complete overhaul of your lifestyle, which is also sustainable and justified. If the changes are not made (i.e. using the helicopter to do the same job as the old car) a small fortune is wasted. In a similar way the popular belief is held that organisations have to change significantly in order to suit their new information systems. In this editorial, we take a critical look at the current approach taken by the industry, and discuss an alternative approach which provides better integration between people, process and IT.

The view of IT as the prime driving force has created a significant drift from modern thinking on production. At the core of construction there are physical processes which are supported by information flows among others. IT projects aim to improve these supporting information flows and the hope is that this will improve the whole process. However, if the actual production process is as chaotic as construction the implementation of IT will not bring desired results, if not make it even worse.

The alternative view, held by practitioners and scholars of quality management, lean production and other related fields, focuses on the notion of process: IT is seen not as a prime driver, but as a means towards designing, controlling and improving processes, and benefits accrue from better processes. The prime driver is the discovery of the principles for improving processes, and their progressive implementation into practice. The best known embodiment of this view is the Toyota Production System (TPS). In Liker's interpretation, one of the TPS principles is: "Use only reliable, thoroughly tested technology that serves your people and processes."

However, in order to take this alternative approach, one must understand processes. There are several alternative understandings, and each understanding leads to a different view on the role and place of information technology. However, the general understanding is that the question is about a production process. But even in this case, any production process can be viewed from three different angles, each of which can be discussed in brief detail: transformation, flow, and value generation (Koskela 2000).

Transformation: In this angle, which has been prominent in the 20th century, production is viewed as transformation where inputs are transformed into outputs during the process. The transformation view of the process assumes that decomposed sub processes are independent; hence they can be treated in an additive manner to integrate the whole production process. It also implies that by optimising or improving each department, section, function and task, the overall production process can be optimised/improved. This view has been widely present in traditional construction organisations where separate departments “own” parts of the construction process. By viewing the construction process from this view alone has contributed to making an already fragmented process even more fragmented.

From the IT perspective, taking only the transformation view on construction has led to islands of information (Hannus, 1996) created by fragmented systems for functions such as Estimating, Planning, Accounts, QA etc. Such systems add to the fragmentation due to limited integration between them, causing duplication, information and value loss. Such limitations and problems caused as a result of islands of information are well known and debated.

Another implication of this view is the assumption of direct benefits from IT. The obvious efficiency improvements at individual activity level are assumed to collectively improve efficiency at the organisation level. Indeed, a view of more IT investment = more productivity/ efficiency is commonly taken when investing in IT systems. Companies which critically evaluate each investment project rigorously do not hesitate to invest considerable amount of money in IT projects without any formal scrutiny. However, there is ample evidence that although IT has improved productivity as far as individual tasks are concerned, productivity benefits at the project, company or industry level are difficult to pinpoint (Koskela and Kazi, 2003).

Flow: The flow angle of production considers what happens to a part in production on a timeline: inspection, waiting, moving, and transforming. Flow view of production makes visible non value adding activities such as moving, waiting and inspection. Flow view also emphasises on principles such as time compression, variability reduction, simplification, flexibility and transparency.

This view on production has been promoted especially by the movements of Business Process Reengineering and lean production. In connection to IT, there are two important issues which accentuate. First, the flow view leads to an important implication: we should be able to precisely pinpoint the mechanisms through which the flow benefits (reduction of waste) accrue from an investment to information technology. Hence, the concept of benefits realisation has emerged (Thorp 1998) .Second, the possibility of IT adding to waste becomes visible: emphasis must be given to potential disbenefits, especially disruption, reliability of new system and utilisation when considering implementation of IT projects (Fox, 2008).

The attitude to IT as held by the flow view can be illustrated by the case of Building Information Models (BIM). They have been hailed as an advanced building lifecycle management solution, especially enhancing the design and construction process through better sharing of information (Leicht, et al, 2007). The related concept of Virtual Design and Construction (VDC) (Fischer and Kunz, 2004) uses multidisciplinary performance models of design-construction projects including the product (i.e., facilities), organization of the design-construction-operation team, and work processes, to support design and construction processes. However, from a flow view, supporting and sharing is too vague as a goal – rather the VDC tools like product, process, and organization modelling tools should be applied effectively to the explicit requirements of lean project delivery (Khanzode, et al, 2004).

Value: The value driven view which is founded in the discipline of quality, implies that value is generated for the customer by production. The focus here is on avoiding value loss by better capture and flow down of requirement, capability of production system, elimination of defects and measurement of value. Processes that directly add value for customer are the focus of this concept. Modern building modelling tools support better value generation as shown by the following examples.

In a discussion about computer aided building modelling tools (Rischmoller et al, 2006), improvements in the value generation within the design process are highlighted. Value generation is more significant during the design stage where client requirements are captured and translated into a design solution. Using such tools, client requirements can be refined early in design stage, before actually issuing any drawings for bidding or construction. Building modelling tools help the value generation process throughout the project by: detecting clashes between various building elements (such as mechanical, electrical and plumbing) early; enabling automated quantity take-off which accurately match design; and providing better visualisation during project meetings. The case study presented also shows that loss of value is minimised as a result of improved flow of the construction process. Similarly, in a study about concurrent design for production, Folkestad (2006) has discussed using 3D CAD systems for an improved design process which help translate tacit interface knowledge into explicit CAD information. Such an approach helps to resolve issues where work from two or more project stakeholders interfaces, hence improving overall requirements capture and transfer, which in turn improves value generation from client's perspective.

However, defining process in terms of product realization or production is not the only possible interpretation. Let's recollect what Deming (1982) said about a production process: "At every stage there will be: Production….[and] continual improvement of methods and procedures, aimed at better satisfaction of the customer (user) at the next stage." The point is that in production, there is also a ubiquitous learning process, which does not get represented in our conventional production theories. In addition, it is argued in organizational theory that the there is a constant process of organizing going on (Knights & Willmott, 2007). Both learning processes and organizing processes are related to people, and to distinguish such processes from production processes, we often but most vaguely call them just "people".

Similarly to the case of production processes, information technology may enable or hinder people oriented processes, and reciprocally these may enable or hinder IT implementation. In her interesting study highlighting the need for design thinking, Beamish (2008) describes a situation where the IT solutions, among other things, hindered learning. Traditional two-dimensional (2D) and three-dimensional (3D) computer aided design (CAD) tools assist experts in creating specifications that define their contractual obligations, but are not enabling cooperation between these specialists (Folkestad, 2006). On the other hand, new understanding of human interaction, language/action perspective, has been taken as a fruitful basis for structuring information systems (Vrijhoef, Koskela & Howell, 2001).

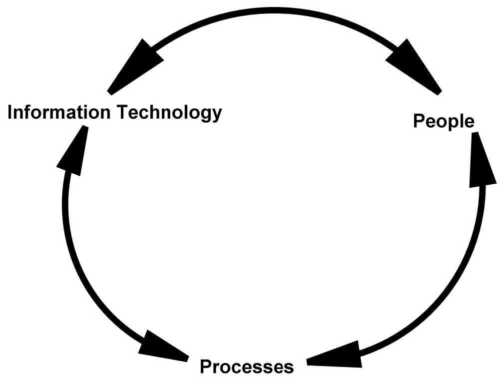

Figure 1 - People - Process - IT

Thus, IT, process and people are identified as the main parts of an organization, which have to be in mutual fit. Of course, this is not a novel insight as such. However, we stress that their mutual relationships are complex, dynamic and synergic. Furthermore, each element is independently evolving, as well as co-evolving with others. Hence, it is clear that a framework is required to address the integration issue. Figure 1 shows a very broad outline of a proposed framework where people, process and information systems support each other. With its two way influences, this framework unifies the two main views, one seeing IT as the prime driver, the other seeing evolving production and people oriented processes as the prime driver.

There is emerging evidence to support this conceptualization. A recent survey carried out by McKinsey and London School of Economics (2004) shows that investing solely in IT applications has a very little impact on manufacturing company's performance unless accompanied by operational change. It was also found that regardless of the company's size, location, sector or past performance, better management practices improve organisational productivity. The most important fact to note is that lean manufacturing coupled with IT implementation brings 20% productivity increase, whereas isolated implementation of IT brings only 2% productivity increase and management practices result in 8% increase. Of course, this proves the earlier insights on Computer Integrated Manufacturing: "CIM acts as a magnifying glass. It makes the good system much better; it makes the poor system much worse" (Melnyk & Narasimhan 1992). Similarly, in a survey carried out by Shelbourn et al. (2007) on the importance of three key strategies for effective collaboration, respondents attributed 40% importance to people, 34% to business processes and 26% to technology.

To conclude, the suggested attention to the interaction of IT, process and people has both practical and theoretical dimensions. From a practical perspective, exciting opportunities towards solving the key challenges confronted by the construction sector are becoming visible by integration of these areas. From a theoretical viewpoint, we have to turn attention again to calls for a better theoretical foundation of looking at IT, people and processes (Fenves, 1996; Sriram, 1998; Björk, 1999).

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