The Myth of Control & Initiative in Product Development

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Abstract

To speed up product development - e.g. to get more time to test the products on users/in use before full production – established principles such as Integrated Product Development (IPD) and Concurrent Engineering (CE) have shortcomings. One of the largest thieves of time and resources proves to be planned stops at gates/decision points. The stops are there to give management a feeling of control and initiative – which is a myth. Especially few and large stops turn out to be a disadvantage. For psychological and practical reasons, a better situation is gained with more gates. The ultimate situation is to have an "infinite" number of gates which means many and "small" decisions taken immediately when they need to be taken. In daily work processes, the principles of "Short Cut", "Flowing Water" and "80/20" also help to reduce development time. These are some of the principles of Dynamic Product Development (DPD). DPD has shown that it is possible to reduce development time considerably compared to when IPD/CE is used at the same time as usability and innovativeness is increased, meaning improved business for companies.

Key Words

Concurrent Engineering (CE), Dynamic Product Development (DPD), Integrated Product Development (IPD), Projects, Project Management

Introduction

When Product Life Cycles (PLC) of commercial products get increasingly shorter, it becomes all the more important for competing companies to reduce development time from idea to introduction of new quality products (innovations) on the market. Shorter development time means more time to be used for user/use tests before the products are launched on the market, meaning better products and better business for the company. For products with extremely short PLCs, short development time can mean the difference between life and death for the company.

In this paper, we will concentrate on four important management issues to reduce development time, while at the same time improving usefulness and innovativeness of the products. The ideas, which are part of a total dynamic theory (see Ottosson 1999), are opposed to established "truths" in science and management. Therefore, these new ideas have been/are often regarded as radical, uncomfortable and even dangerous by these societies as they break against existing doctrines and rules, like the German VDI 2222, company rules (e.g. Ericssons PROPS-model) and perhaps also ISO-9000. However, as DPD build on solid ground in quantum mechanics (see e.g. Görnitz

1999), on chaos theories (see e.g. Greschik 1998 and Peitgen, Jürgen & Saupe, 1994), and as the ideas also prove to stand up in real industrial projects, we persist to tell of our "heretical" doctrines for those who want to listen and benefit from them.

For the practical use of DPD, extensive testing and development has been carried out in Sweden since the early 1990s, both on student projects at Halmstad University and in industrial projects (e.g. Ottosson 1996, Björk 1999) as well as in internal and external industrial projects at Frontec Research & Technology AB (FRT) since 1998. Typically, we have found that prototypes are produced in half the time compared with what in our experience would have been needed using the static methods IPD and CE.

Investigation

To complement our knowledge of how product development is carried out at present in major Swedish companies, we have conducted extensive unstructured interviews with a few of the senior consultants of FRT during the spring 2000. The company is a firm of consultants, currently with 125 employees. 15 are PhD (Dr.Ing.), 60 are MSc (Dipl.Ing.) and 40 are engineers without academic examinations. The consultants are mostly working in larger projects at some of Frontec's more important customers (e.g. Volvo Trucks, Volvo Cars (Ford), Saab (GM), Hasselblad, Autoliv, Ericsson, AstraZeneca, and Mölnlycke).

Some findings from the interviews

All FRT's major customers are today working with project teams and use formalized project management strategies. The basic for project management is a chain of activities separated by gates or decision points. The number of gates varies from four (Saab/GM) to seven for most companies. When seven gates are used, they generally follow the schedule shown in figure 1:

Initiation – **Gate** – Pre-study – **Gat**e – Feasibility Study – **Gat**e - Development – **Gate** - Test & validation – **Gate** – Implementation – **Gate** – Termination

Fig. 1: Traditional way of performing product development from initiation to termination

When fewer gates are used, they are a mixture of these seven paths. Also, in some cases the number of formal gates is larger when e.g. "Development" is divided into smaller sections.

In front of/before each gate, a large amount of work is generally carried out to collect data, conduct detailed long term planning, follow up plans, write detailed reports, produce presentation material, carry out rehearsals and, finally, present the material to the project board/management. Of all this work, perhaps only 10 % can be regarded as being important material for the future of the projects. Unfortunately, detailed long term planning in general is counter-productive as it engages the project leaders and prevents them from taking advantage of new possibilities during the work between the gates. Unfortunately, activities are generally not followed up in the companies and consequently, only a feeling of what is really done exists. Such feelings reveal that

more than 50 % of the time is often used on other topics than pushing the project forward. Also, the gates give the project leaders the possibility of extorting the line organization for extra resources so that the line organization will not be blamed for the project not reaching the goals.

At the formal presentation at the gates, the project board/management acts as a customer or a judge who has to be convinced that the project ought to gain permission to continue. Most of the work before the presentation therefore has the form of confirming the work that has been carried out. In case of delays and overdrawn budgets – which seem to be normal for most development projects – much work is made to explain why the discrepancies have occurred. As the worst thing that can happen for everybody working in a project is that their development project is stopped before its completion, the documentation must possess the right tone. Thus, tactics on what to show and how the information should be presented is important if the project is not to be stopped at the gates. A "Go-decision" means that the project leader and the teams are released from the responsibility of what has been achieved up to that point, which underlines the importance of gaining the support of the board/management for the project. It also underlines the rather absurd situation of using formal gates as steering tools for the management.

During the meeting with the project board/management, an uncontrolled situation is always at hand as irrational things can affect the outcome. If, for example, the board chairman/manager has a bad day, if someone on the board does not like a presentation, if someone has heard a negative rumour, etc, it can mean the whole project is stopped or postponed in order to gather more material before a final decision is made. A postponed decision means a lot of extra work, which means delays and extra costs for the project – which often also drastically decreases the potential for the project and its sub-projects.

Generally speaking, the fewer the gates, the more vulnerable the project will be. This is because the decision material at each gate will be more complex and difficult to judge. Especially hunted/overloaded top managers and board directors can become irritated when they have to spend a lot of time on a complex situation and/or when a "Go-decision" means large sums of money to be invested. Fewer gates also mean that the gap will be bigger between board members/managers and the project leaders. A greater mental distance means that important informal information will not be shared between the management and the project leaders. As always, making decisions based on formal material and formal presentations causes low quality decisions if real decisions have not been taken informally earlier – which in such cases means a costly "play for the galleries". However, without informal decisions in most cases no "well planned projects" should have survived due to our findings.

Many gates/decision points instead of a few means that the mental distance will decrease between board/management and the project leaders so that also informal information will influence the decision, thus implying better decisions. Adjustments decided by the board/management also tend to be less far-reaching and difficult to accept when more decision points are used. It is well known in industry that far-reaching changes in an organization are always difficult to implement and the longer one way of working has been a reality, the mentally harder and the more

time/resource-demanding it is to make the changes. Thus, there are many advantages to using more gates/decision points than fewer.

A conclusion from our findings is that gates give management a false security and feeling of control and initiative. Perhaps even worse is that the gates discharge responsibility for the past from the shoulders of the project leaders, which is bad for the projects seen in the long term. Another effect is that this scientific management way of thinking – which Frederick Taylor introduced (1911) - fosters administrative-bureaucratic-political project leaders and not the entrepreneurial project leaders needed to make product winners of the future. Entrepreneurs move towards a vision while managers follow formal plans. Actively influencing all the small changes (the so called "Butterfly Theory" in Chaos Theories) is therefore for entrepreneurs the most important method of gaining initiative and controlling the process – which is opposed to strictly following a long-term plan.

For responsible/engaged people working in a static system with an administrative project leader, the situation often gets absurd as formal reports and administrative work by the project leader is regarded as more important than the progress of the project. Not unusually, team members in such a situation do not make planned activities; they shirk from work and/or even carry out guerrilla tactics to save the project from a probable failure. Later, when the project thanks to these activities is secured, the project leaders and/or management generally get their rewards, and appraisal is done over the "good planning". One well-known example of this in Sweden is the development of the exceptional successful medical product Losec by AstraZeneca. Management in that case tried several times (Östholm 1996) to stop the entrepreneurial project leader who, however, always found ways to continue the project inside and outside Astra. When the economical success was evident, the former management of Astra was heavily rewarded for their "foresight" bringing forward the most profitable product in the industrial history of Sweden (Östholm 1996)! Our investigation clearly indicates that creativity in combination with "guerrilla tactics" function as grease in the machinery for the projects but as sand in the machinery for formal management cheering the myth of their control & initiative of the product development process.

A metaphor

Performing product development in accordance with established strategies thus means the performance of carefully planned development between gates and not to pass the next gate without prior board or management approval (see e.g. Andreasen & Hein 1987, Pahl & Beitz 1988, Wheelright & Clark 1992, Cooper 1993, Ulrich & Eppinger 1995, Dhillon 1996, Ullman 1997). A metaphor for the static behaviour is sending out cars on a road with few "exits". When a stop occurs due to unplanned events/accidents and when stops are arranged (i.e. gates or decision points), tempo and momentum is lost for all cars between the "exits" as they can do very little besides stop and wait for the traffic to start moving again.

At a stop, one first has to slow down/brake the car. To start again once the stop has been removed involves accelerating the car. Braking and accelerating costs time and energy (money) compared with not braking and accelerating. Stops should therefore be avoided by every means available, which is a central principle in DPD. The more

cars that are on the road - the more people that are engaged in the development process - the more a negative chain reaction back in the whole system there will be when all cars have to stop to avoid crashing in to each other. Also, small accidents – secondary stops - can easily occur in such situations, which further delays the process. When the primary stops at the gates are removed, the start– like the pull of a rubber band - will also be slower the further back in the line one comes.

By building motorways with many lanes, unplanned (unwanted) stops can be reduced compared to when a few lanes are used. Many lanes equal parallel work (Integrated Product Development – IPD and Concurrent Engineering - CE) in the development process. Parallel work, which was used in all the Swedish companies represented in our investigation, has been reported to allow time reductions of up to 40 % (e.g. Griffin 1993, Trygg 1993, Hanefield 1994) compared with purely serial work. These figures include the stops created at the gates - so just imagine what would be the case if the gates were taken away!

The cornerstones of DPD are entrepreneurial project leadership and no formal gates but many small informal decisions and a large amount of continuous feedback in the projects. Thus, the free motorway without tollgates is what characterises DPD. Also, the use of off-road vehicles, helicopters, submarines and other vehicles is allowed when they can speed up the process, as all stops in DPD – large and small – should be avoided by every means available!

The rules of "Taking Away Stops", "Short Cut", "Flowing Water", and "80/20"

The best way to replace the myth of control & initiative with real control & initiative is to use many decisions instead of few. In DPD, this is called "Taking Away Stops", meaning concentration on gates in short-term intervals - down to weeks or even days in turbulent times. These many gates must be coupled with many visits to the place of work ("management by walking around"), many follow-up meetings, short weekly reports from all team members, careful weekly planning towards goals/visions and information meetings when they are deemed meaningful. Instead of planned weekly meetings with and within the teams, deliberations are used whenever a new difficult problem arises.

To fulfil a development process, different tasks must be carried out. It shows that the order in which tasks are carried out is not important as long as they are carried out – which is opposed to what static principles state (e.g. IPD/CE). Figure 2 shows the principal differences between DPD and IPD/CE in that respect. Note that time reduction should not be measured as the length of the arrows, since each arrow takes roughly the same time to complete. Thus, it is the number of arrows that indicates the time used to complete the development project.

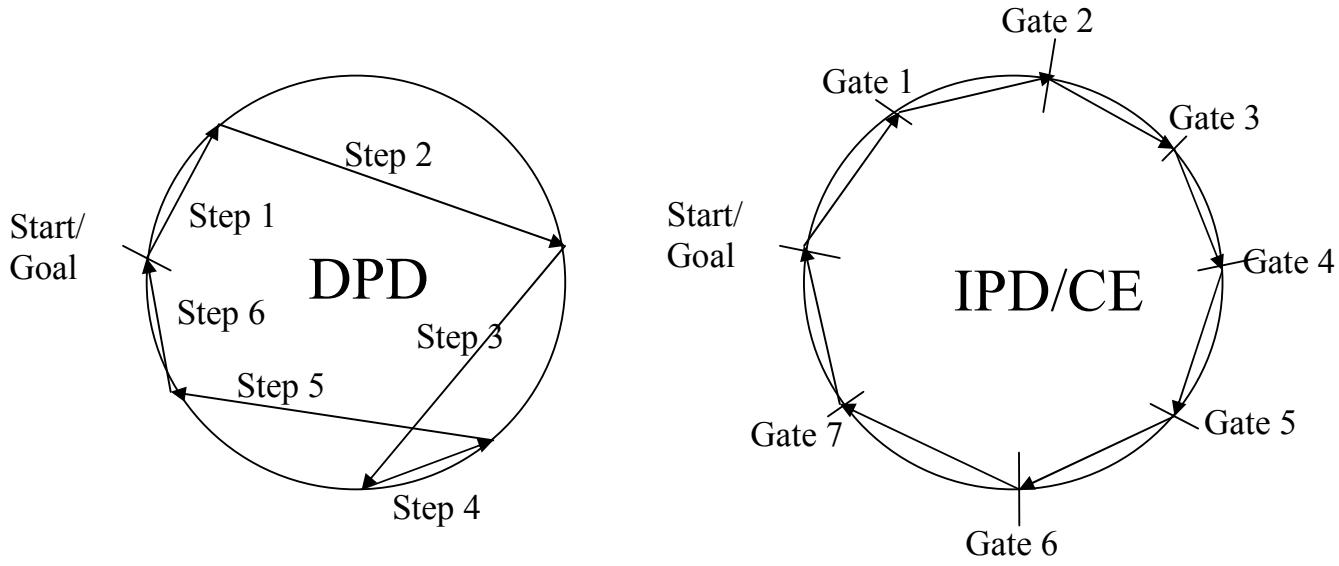

Fig 2: Performing DPD entails taking short cuts as often as that is possible to gain time. Performing IPD/CE entails following strict procedures, which in turn means planned stops at the gates and unplanned stops between the gates

To speed up the pace in each arrow in figure 2, the principle of "Flowing Water" is feasible to use. This principle means not stopping at a small/easy problem but trying to circumvent the problem in a similar way as water flows around an obstacle. Small/simple problems are left for a later attack. If they need to be solved immediately, a special task force is set up to solve the problem so that the original team can continue its work forward. As the mission of a development project is to end the project as quickly and as cheaply as possible, the difficult/principal/large problems must be pinpointed and solved using all the best forces so that severe stops will not eventually occur in the project. If the most difficult problem is not solved first, it is often rather meaningless to solve the simple problems at all. In traditional static development, it seems too often to be the case that easy problems are solved first and not the difficult problems, which causes severe problems.

The way large and small problems are solved can be more or less efficient and time consuming. Here, the principle of "80/20" is useful. This principle entails proceeding further to test an idea/solution when it is good enough (80 %). Of course it is difficult to know beforehand when an 80 % solution is reached or not. Only experience can help to judge when a solution is good enough to test. The "80/20-principle" thus means that the best solution should not be a hindrance for good solutions. Testing sufficiently good solutions and not waiting for the best solution to occur provides a perfect learning situation and a reduction in development time. However, with three iterative turns of solutions in the range of 80 % fulfilment, an almost 100 % solution can be gained in a total time frame that is often much less than if only one turn is made with a 100 % solution. The "80/20-principle" – which is connected to the law of Diminishing Returns (see e.g. Cepa 2000) – means that knowledge is gained in each turn in a way that is not possible to gain without the preceding attempt.

Another reason for the use of the "80/20-principle" is that in a dynamic reality – which we all live in – the outer and inner conditions are constantly and suddenly/occasionally changed, which means impossible chaos situations to foresee and to plan for. Only by choosing sufficiently good solutions can fast progress be made. This is why laws always come too late and often attack the wrong problems when they are eventually decided in parliament.

Conclusions

To save time and money in product development, it is of the utmost importance to avoid stops by every means available. By using the principles of "Taking Away Stops", "Short Cut", "Flowing Water", and "80/20", substantial gains can be achieved in development time and money. Using the full concept of DPD has proved to reduce development time considerably compared to when IPD/CE is used. Usability and innovativeness is increased at the same time, meaning better business possibilities for companies using DPD as a development model.

DPD put higher demands on every team member and project leader as they have to take own initiatives and take on own responsibility for the work. It is therefore not easy to transform an organization from serial/static thinking to dynamic thinking.

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