

From Pen and Paper to IT Based Business - tracing employees learning progress in an e-learning program

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Abstract: This paper is part of a larger empirical research project "Flexible e-learning environments and learning style"¹ which is carried out together with a large Danish company. The company involved is named Large Danish Company (LDC). LDC has bought "Company 1" and "Company 2" in another European country. These two companies have had to move from traditional pen and paper business to IT based business and an e-learning program has been implemented by LDC. This paper is based on 2753 employees participating in the obligatory e-learning program. The objective of the program is to teach the employees their new job functions and task in an IT based office environment.

The courses in the program focus on the employee's future job function and the course materials are development to be flexible. Initially the LDC considered applying a FlexLearn approach developed at Odense Tekniske Skole (OTS). However a different solution was developed in which the flexibility build into the course program means that the program is divided into steps. With each step the level of difficulty increases. The employees were categorised in three groups according to the time they spend to pass a course in general banking business and e-learning. : Low User Group, Middle User Group and High User Group. An employee assigned to the High User Group start at step 3 in the first course, whereas an employee from the Low User Group start at step 1 in the same course.

The objective of the paper is to describe this learning approach and to investigate the learning progress of the three groups. The results show an interesting migration patterns between the three groups, but also revealed surprising results in relation to time spent by the different groups on the courses. We discuss this in relation to the FlexLearn approach and draw up perspectives for further work.

Introduction

The Large Danish Company (LDC) is a leading institution in Denmark and one of the world's biggest companies in its branch. The primary business is retail in Northern Europe. LDC is founded on IT and this is one of the main reasons for its success. However one of the problem the company faces is – when expanding to other countries –that the employees from other countries are not necessarily used to working in an IT based company, and lack the competences and qualifications that IT requires. It is therefore essential to LDC to educate their new staff not only in LDC business procedures and praxis and their new job functions, but also in hands-on IT. With this aim, LDC has implemented an e-learning program which is seen as a key to success.

Initially the LDC considered applying the OTS FlexLearn approach the essential of which is an individual learning program based on an analysis of the employees personal learning style and designed with flexible learning objects and a mix of face-to-face and virtual interaction. However concern with costs and time resulted in a different e-learning solutions where employees were categorized in three groups: Low, Middle and High User Group, according to the time they spent on passing the first course.

¹ PhD "Flexible e-learning environments – learning styles" –expected finished at 1 April 2010. Soelberg, Bent
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In the paper we investigate the learning progress of the three groups and the paper is structured in the following way. We first give a short description of the process of implementation and give an overview of the courses in the program. On this basis we turn to the log data and our analyses. Our assumption is that the Low and High User Groups will show significant gains in terms of learning progress and learning outcome as opposed to the Middle User Group that will progress at a more steady pace. However, the analysis shows a different picture and we discuss this by relating it to the theory of flexible learning. The final chapter is a conclusion which raises a number of questions and points to future research

LDC's process of implementation

In April 2006 the two new companies (Company 1 and Company 2) converted to LDC's IT system, and procedures to introduce the core business of the LDC, and the platform for e-learning took place concurrent. Among the employees April 16 is spoken of as the M-Day (migrations day). Prior to this, in January 2006, the employees had been informed of their individual training programs and the new learning method (e-learning) that would be used.

To prepare the employees for the migration day, the LDC started up a training programme for a selected group in the Customer Direct division. Customer Direct is the primary people behind the desk in the company and they had early access to the test portal. Prior to M-day LDC had also carried out a program training team managers and "champions" as trainers. The aim with the trainer program was to bring team managers to a level where they would be able to actively help the personnel be successful with their training. This training of managers and "champions" started two weeks before M-day and was managed by floor walking guides, managers and the training coordinator. It was basically an individual on-the-job training using the web platform that had been managed by headquarter.

The LDS's headquarter had developed a Learning Management System which would automatically log the employees interaction with the e-learning system. The log files are anonymous, only to be used for research purpose. The aim of the research is to improve the learning setup for the employees.

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Presentation of the empirical data:

The data material we have access to contain empirical data from the new market, (named company 1 and 2) and from Sweden, Denmark, Norway. The e-learning program with the number of employees offers unique data from almost 20.000 persons (see below table 1). However, in this paper we focus on the empirical data from the new market: Company 1 and Company 2. In the data material is a total of 3.059 employees. However they did not all participate in all courses, some were on vacation, sick etc, so our analysis covers 2753 employees and focus is on their progress with the e-learning program.

	Employee	Number of employee ¹
1	Company no. 1	769
2	Company no. 2	2290
3	Scandinavian 1	1411
4	Scandinavian 2	14.092
5	Scandinavian 3	1248

Table 1: Number of employee in total data material

There are 14 courses (out of a total of 26 courses) in LDC`s basic e-learning program (see table 2) . The employees are expected to take the courses in the order listed below.

Course name	Course Id	Number of employees in course
Introduction to e-learning	7992	2815
Introduction to group platform	7876	2780
Portal-overview	7877	2772
Business procedures & handbooks	7878	2759
Organizational Data	7995	2757
Security	7880	2745
Customer portal – Introduction	7886	2465
Introduction to Product Knowledge	7881	2052
Introduction to Customer Portal – Personal	7887	2005
Request/changes	7937	1995
Customer Service Request – Introduction	7934	1990
Core business	7942	1966
Statements	7938	1952
Company Credits	7941	1947

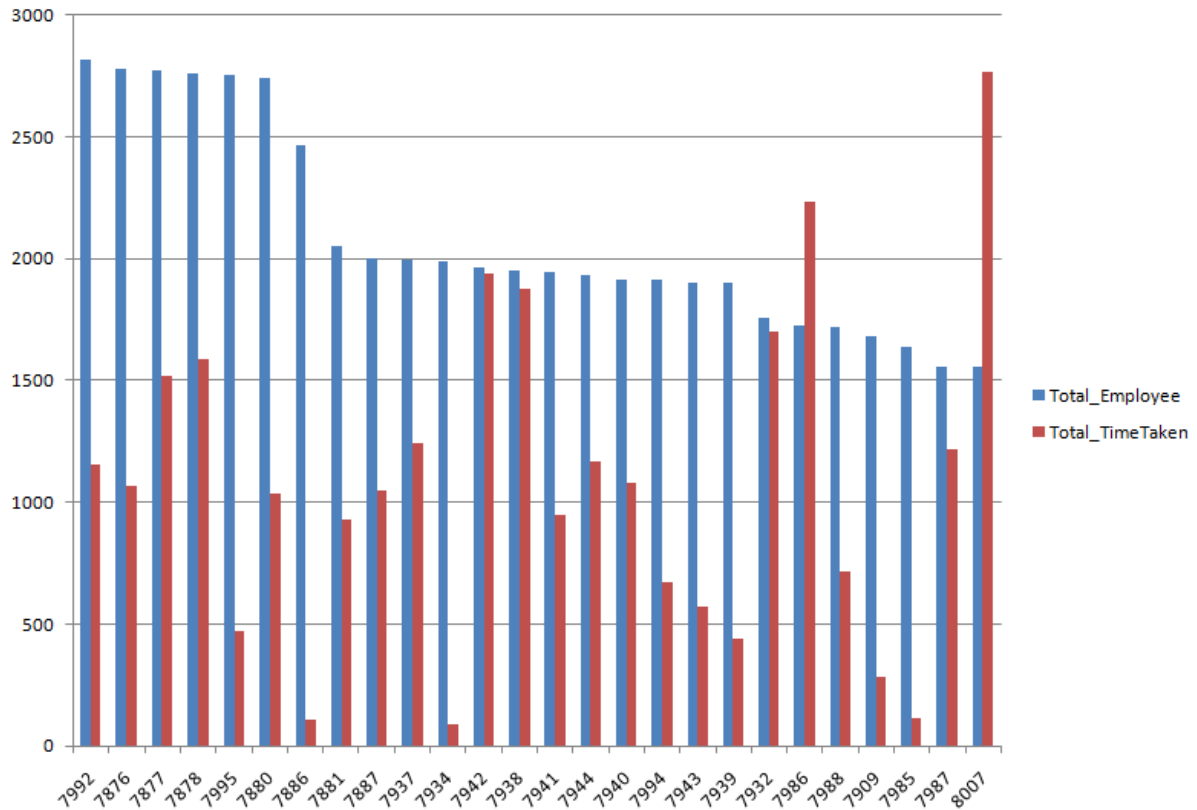
Table 2: Courses and numbers of employees participating

The first three courses are general introduction to LDC`s general IT systems and the next three are bank business courses and together they make up the baseline for further courses. The next three courses are introduction to the custom portal. These courses are very important to the personnel who have contact with the customers directly. The last five courses do not depend on each other, but are intended for employees that need the specific skills in their daily work.

¹ The data materials contain all employees using LDC`s learning system in spring 2006.

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The graph below gives a view of all 26 courses; total number of employee taken the courses, and how much time they spend on each course.



The graph shows a big variation in time spend on the courses and in the number of employees having passed the courses. In the following we will focus on two courses; course 7992 because this is the first course and it has been passed by most employees. It is also the course on the basis of which the employees were classified into the three groups. The other course is 7878, this is the fourth course for the employees. We have chosen this course because nearly all employees have also participated in this course, and it places the employees well into LDC general e-introduction and we expect the learning progress in the groups and the migrations between the groups will show clearly.

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Analysis of the data Material

We are interested in following three groups. The first group is employees who use less time finishing the course and this group has been categorized as the High User Group. The second group is the employees who uses most time, and this group is named the Low User Group and finally the third group of employees falls between the two, this is the Middle User Group. The three groups are identified according to time used to finish the first e-learning course, no. 7992 for the 2815 employees (table 4). In the log material for course 7992 we see that the three groups should be differentiated with time restrictions:

Number of employees	Time-Taken	Group
939	13355 ->more	Low knowledge = Slowest
939	13355-5668	Middle knowledge = Medium
937	5668->less	High knowledge = Quickest

Table 4: course 7992 Number of employees, time-taken and the group classification

We are also able to follow the employee's migration from one group to another. Our initial assumptions were: The Low and High User Groups will show a significant gain in terms of learning progress as opposed the Middle Group that will progress at a more steady pace. The data logging allowed us to trace how the employees move from one course to another. Again we start with the baseline in course 7992, on which the categorizations of the employees have been based. Our interest is to see where the employees go after finishing course 7878. Do they stay in the same knowledge category or do they move according to our assumption?

The figures in Table 5 below show the movement of the employees in the Low User Group in baseline course 7992, when finishing course 7878. The table shows that 515 employees remained in the Low User Group, 252 employees moved to the Middle User Group and 152 moved up to the High User Group.

	low7878	mid 7878	high 7878
low 7992	515	252	152
mid 7992	285	382	253
high 7992	119	285	510

Table 5: Number of employees and their movements in between groups when passing from baseline Course 7992 to course 7878 (the two courses have the same number of employees, that is 2753 employees who are also identical).

The data gives us the following figures marked with grey: 515, 382, 510. They tell us that 515 employees who started in the Low User Group remained there after passing course 7878. 382 employees remained in the Middle User Group after finishing the course 7878, and finally that 510 employees categorized in the High User Group in course 7992 were still there after finishing course 7878.

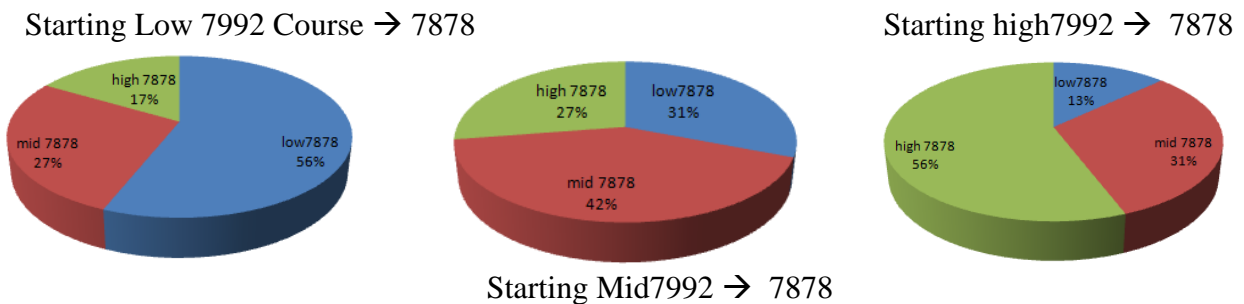
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Below we have chosen to illustrate the same data in a graphical representation (graph no. 1).

The migration of employees who started in the Low User Group in course 7992 till they pass course 7878. If we look at the pie on left side, we see that there 44% of the employees who come from the Low User Group in course 7792 migrated to the High/Middle User Group in course 7878.

The migration of employees who started in the Middle User Group in course 7992 till they pass course 7878. If we look at the pie in the middle, we see employees who passed course 7992 and is categorized as the Middle User Group. They also passed course 7878, however, 42% of the employees stayed in Middle User Group, 27% moved to the High User Group, but 31% dropped down to Low User Group.

The migration of employees who started in the High User Group in course 7992 till they pass course 7878. In the pie on right side, we se employees from course 7992 already categorized as High User Group. When this group passed course 7878, 56% of the employee stayed in the high group, however, 44% dropped down to the Low or Middle User Group.



Graph no. 1: Migration of employees between Low, Middle and High User Groups when they move from course 7992 to 7878. The graph also shows the percentage that remained in their original User group and the percentage that moved to another User group.

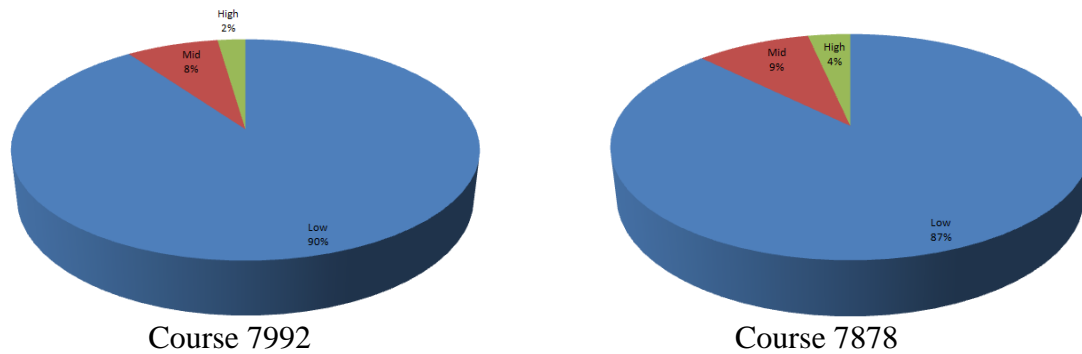
In graph no. 1 we saw the migrations of the groups from one course to another. But we have no indication of how much time the different groups spend on the different courses. This is illustrated in table 6 where the figures show how much time was spend total in Low, Middle and High User Group in the two courses.

	7992	% of total	7878	% of total
<i>Low</i>	103.908.528	90	138.814.179	87
<i>Mid</i>	8.772.760	8	14.652.905	9
<i>High</i>	2.649.919	2	5.425.804	4
Total	115.331.207		158.892.888	

Table 6: Time spent by the different groups on course 7992 and 7878

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In graphical illustration no. 2 we have visualized the difference and it becomes more clear (and surprising): Nearly 90% off all the time spend on all the courses is used by the Low User Group. They spend the longest time of all three groups to pass the courses. However, as shown in graph no. 1, 66% remained in the Low User Group hence their performance only improved little from course 7878 to course 7992.



Graph no. 2: Time used on the two courses 7992 and 7878 in the three groups; Low User Group, Middle User Group and High User Group

FlexLearn

We started out with the assumption: “*the Low and High User employees in flexible learning² environments improve their result significantly, while the Middle User Group only shows little improvement.*”

This assumption is based on the experiences gained at OTS. The FlexLearn approach of OTS is founded on David Kolb’s theory learning styles with the four styles identified by Honey and Mumford: The Activist, the Reflector, the Pragmatic and the Theorist and it is also inspired by blended learning. “Blended Learning is learning that is facilitated by the effective combination of different modes of delivery, models of teaching and styles of learning, and founded on transparent communication amongst all parties involved with a course”.³ The term also refers to the mix of face to face learning and e-learning. People do not only have one learning style, but they have one preferred learning style which is combined with elements from the other styles. The learning style is very individual and may differ depending on the situation: job, hobby, sports, coaching, etc. To enhance the learning process for the four learning styles OTS applies a blended learning approach, because it makes it possible to develop personal learning programs which are flexible and continuously adaptable to the individual learner’s needs and level whether s/he is a theoretic, a pragmatist with preference for hands -on etc.

² Flexible learning environment based on the concept FlexLearn® where the learning elements are founded on the learning styles

³ Researcher Procter, Chis. [2003].

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The first time a student comes to the FlexLearn⁴ environments s/he starts with a learning styles test based on David Kolb⁵ theory. Students are tested every time they start a new course to identify their level of knowledge in relation to the specific course and their style. Based on the test results a teacher enters into a dialogue with the student to make her/him aware of hers/is learning style, it's strengths and weaknesses. Also the courses are developed with flexible learning objects and with different steps of increasing difficulty, and an individual course is designed to fit the students learning style and level.

The FlexLearn environment is based on a Learning Management System (LMS). The system gives the students a clear overview, shows what is expected in a specific course and allows them to see all the details of their individual learning activities. What they have done until now and what they have to do in the future. The system functionality also allows students to chat with each other, see who is online (teachers/other students) etc. The students can access the system at the college, at home or from the company where they work. The LMS is designed so the teacher can follow a student's progress and interact with the student to help the student learn what is required for tests or exams.

FlexLearn and LDC – discussion

Initially the OTS FlexLearn concept was considered in LDC, but as already stated, concern with costs and time resulted in the application of an e-learning program with reduced flexibility. As a consequence the employees were not offered a learning style test before beginning the LDC e-learning program, nor was their individual learning program designed for their personal style. Instead they were categorized in three groups based on the time they spent passing the first course, and the individual training program became a stepwise progress of courses they had to take, and their course steps were identified a priori by the categorization of their knowledge.

Our assumption was based on research from OTS where the FlexLearn model is fully implemented. However, with the LDC's courses the results showed a different picture: Of the employees classified in the High User Group 56% remained in the High User Group in the next course, but 31% went to the Middle User Group and 13% to the Low Level Group. In the Middle User Group 42% continued in the same group in the next course, but 27% moved to the High User Group. Though 34% in the Low User Group moved to the Middle or High User Group 66% continued in this group for the next course. Looking into time spend on courses, we found that the Low User Group spends a total of 90% of all course time registered for all employees in all analyzed courses.

One possible explanation may be the lack of testing for learning style and the consequent lack of individual study program and of information to the employees about their learning style. The LDC did not test the employees before starting the e-learning courses, neither was the learning material categorized in relation to the four different learning styles nor to the individual.

⁴ Kolb, D.A. (1984): *Experiential Learning: Experience as The Source of learning and Development*, Prentice Hall, USA

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Conclusion and perspective on future research

The analysis proved our assumption wrong. It showed that the Low User Group and High User Group are very stable, 56% of the employees who are categorized in either Low or High User Group stay in these groups from one course to the next. The Middle Group, however, is moving to the Low or High User Groups. But the analysis also surprised us with the results showing that 90% of total course time registered is spent by the Low User Group.

With the further analysis of data (cf. table 7), it was surprising to find that the Low User Group was using approximate 90% of all time spend by all employees on the two courses we have analysed. This is an unanticipated result and it is clear that this time factor needs to be understood better and needs to be contemplated in relation to the learning styles. One question comes to mind: "Could time be reduced and be spent more efficient, if the employees have a learning style test before starting the e-learning courses and if the employees have access to learning elements that have been correlated with their learning styles"?

We can see that the Low User Group have some gain from the learning principle used in this case. In our further work we would like to analyse courses, time spend and the job function of the employee in the company, to see if there is a correlation between the different factors. We also find that it may be relevant to look closer at the logon time of the employees: when do the employees use their home internet line and when do they work with the courses at work. An assumption being that at work they are often disturbed, and have to deal with other tasks whereas at home they can concentrate on the course, however they may have a slow connection.

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