Sustaining Sweden's competitive position: lean lifelong learning

Raine Isaksson, Rickard Garvare, Mikael Johnson, Christer Kuttainen and Jörg Pareis

Raine Isaksson is a Senior Lecturer based at Department of Industrial Engineering Sciences, Uppsala University, Visby, Sweden. Rickard Garvare is a Professor based at, Department of Business Administration, Technology and Social Sciences, Luleå University of Technology, Luleå, Sweden.
Mikael Johnson is an Assistant Professor, based at CTF – Service Research Center/SAMOT (Service and Market Oriented Transport Research Group), Karlstad University, Karlstad, Sweden.
Christer Kuttainen is an e-Learning Director, based at Norrbotten County Council, Norrbotten, Sweden. Jörg Pareis is an Assistant Professor in Marketing based at CTF – Service Research Center/SAMOT (Service and Market Oriented Transport Research Group), Karlstad University, Karlstad, Sweden.

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Summary

Purpose – *The purpose of this paper is to explore what options the adult learner has for continued learning and what role universities are playing in providing net-based education. Current options for lifelong learning and improvement opportunities in the educational process are described based on an assessment inspired by principles of lean management.*

Design/methodology/approach – *Sweden is chosen as an example. The current level of net-based university education and the demand for it is assessed using official Swedish data. Lean management principles are used as a starting point to define parameters for interest for the adult learner. These parameters are then converted into a five-level scale for assessing current performance with focus on university courses. The authors also study how Swedish County Councils manage their employee education and carry out a check of courses offered by massive open online course providers.*

Findings – *Lean management principles in combination with customer focus seem to present relevant parameters for assessing distance education. Preliminary results indicate that lean lifelong learning has a considerable improvement potential. The main reasons for this potential seem to be more of a bureaucratic and political nature, whereas technology and resources appear to be less of an issue.*

Practical implications – *The results have implications for both universities and organisations. The pressure on universities to become more customer-focussed, while at the same time, cost-effectiveness is likely to increase.*

Originality/value – *Using the customer perspective for educational services and applying lean principles to education.*

Keywords *Lifelong learning, Organisational learning, Competence development, Distance education, Lean learning, Massive open online courses*

Paper type *Research paper*

Introduction

Most organisations are subjected to accelerating change, which puts focus on their learning ability (Hallencreutz, 2012). The quick pace of external change puts pressure on organisations to continuously adapt and to acquire new knowledge. The estimate is that up to 70 per cent of organisational change initiatives fail, see, for example, Beer and Nohria (2000). Peter Senge writes about the learning organisation and claims that the only sustainable mode of competition is the speed to learn quicker than the competition (Senge, 1990). To have organisational learning, there must also be individual learning, which puts focus on lifelong learning. From a perspective of national competitiveness, it should be an advantage if new knowledge is easily accessible. The lean philosophy has been successfully spread to several fields, like to health care (Mazzocato *et al.*, 2010). However, applications for education still seem to be scarce. Antony *et al.* (2012) write that:

> Although LSS (Lean Six Sigma) as a powerful business process improvement strategy has been around for over ten years, its applications in the context of HEIs are still in their embryonic stages.

Compared to their younger classmates, working mature students could be expected to know more clearly what they need. Studying in parallel with a traditional employment requires customisation of the provided education, just in time delivery and probably also evening out the working load (heijunka) to suit the learner. With the quick pace of change those graduating today might have to look at several cycles of re-education and complementary education. For a company to stay competitive and to reach and sustain enterprise excellence, they would need to find a way of continuously upgrading their employees. Unlike traditional learning in universities where students are prepared to master generic competencies and skills a company would have more specific requirement for additional learning. For a company, it should be beneficial to have access to on the demand education. This could be compared to lean management and the principles of avoiding stocks. Instead of frontloading knowledge that might be useful, companies could specify competence needs both to content, extent, level and pace of delivery. It could be argued that leaning learning could be a way to increase both effectiveness and efficiency of learning – doing the right thing in the right way. The traditional education on campus with generic courses would most likely not have a good fit with requirements. Instead, net-based learning could probably in a much simpler way be customised to needs. There has been rapid development in the net-based technology. These developments have recently been manifested in the so-called massive open online courses (MOOCs). The Stanford course "Introduction to Artificial Intelligence" attracted 150,000 students (Corporatelearningnetwork, 2013). The New York Times declared 2012 "the year of the MOOC". With continued development, the MOOCs probably will change and they might go from mass production to mass customisation. If this can be done with cars, it should be doable with education. The company that could access the right knowledge just-in-time should gain an advantage in being the one that learns quicker than competition. The required knowledge could be provided via different channels. It could be coming from universities as distance courses or MOOCs and it could be provided from private enterprises or generated internally in the organisation.

Sweden is an IT-savvy country with a well-educated population and has a tradition of net-based learning accessed via universities. For Swedes and European Union citizens, university education is free of charge both on campus and distance. This makes university distance courses an attractive option. Universities in Sweden for some 20 years have been providing net-based courses, and until recently, there has been a steadily growing number of distance students. From 2012 to 2013, here was an 8 per cent reduction of distance courses (SHEA, 2013). Assuming that interest in distance education is increasing, this could mean that course availability is reduced, negatively affecting the access to relevant knowledge. Many Swedes are fluent in English and they could, therefore, tap into the increasing number of MOOCs that often are in English. These therefore constitute another option for access to knowledge. Free of charge net education and the available quality of it is increasing rapidly (Haggard, 2013). This is a quickly evolving field that might become quite competitive and customer-focussed (Weller and Anderson, 2013). Technically, it should be possible to customise courses in scope, level, extent and speed for individual students. For lifelong learning, MOOCs are therefore a promising development. The first studies of MOOC participants' experiences show an individualised and need-focussed application of the courses (Veletsianos, 2013). In particular, the flexibility of scope and speed is appreciated, combined with the freedom of not having to finish the course, but instead being able to choose the most interesting and important parts (Londeore, 2013).

Many Swedish County Councils are organising their own education. As an example, medical doctors need continuous updates. Courses have to be set up quickly and sometimes only run for short periods of time. For this, different e-learning solutions are used. "On the job learning" differs significantly from university studies, but could still provide some interesting insights on learning. Need-based courses could be expected to be much more customer-focussed. With working students, stronger focus is on efficient use of time to learn something identified based on needs. This is somewhat different from

university studies where the length of education often is standardised without it necessarily directly relating to forthcoming competence needs.

The question is which option would be the best for companies to pursue to secure access to relevant knowledge to sustain Sweden's global position as an export lead country. We have looked at three options for adult learning:

1. University distance courses.
2. Company internal courses.
3. Massive open online courses MOOCs.

Methodology

We study options for adult learning, concentrating on how the Swedish University system is performing to support lifelong net-based learning. The highlighted improvement potential is discussed with the purpose of identifying drivers and barriers for more effective and efficient learning. We study official Swedish statistics to explain the general interest for university-level distance courses in Sweden, looking at both demand and offering. Based on lean management principles and customer focus, we propose an assessment matrix for net-based education including five parameters. For each parameter, we create a Likert scale of 1-5, with 5 being a proposed benchmark. These parameters are then used for examining Swedish university courses. For this, we use the website www.studera.nu that presents available university courses within the country. To delimit our study, we restrict the examination to the area of quality management (QM). A reason for this is that the area has relevance for many adult learners. Another explanation is the insight that the authors have of the area. We carry out a search for the words "Lean" and "Kvalitetsteknik" (QM/Quality Technology). The parameters used are: existence, extent, waiting, pace, all graded by five-level Likert scales. Additionally, we look at availability as number of applicants per study place based on some convenience sampling of courses. The reason is that this indicator cannot be extracted from www.studera.nu. We also look at the ratio of number of QM courses on distance compared to total number of courses. This is additionally done for some other topics as a check of if the results for lean and QM distance courses are typical. We also study how county councils manage competence development of their employees with the purpose of finding ideas for benchmarks. This is done by one of the authors working for a county council. We also do a brief search of MOOCs in QM and lean on the learning platforms such as Coursera, EdX and Udacity that are well-known MOOC providers. We have not looked at commercial offerings for distance education.

The assessment matrix

Isaksson *et al.* (2013) interpret lean for educational and research processes based on Liker (2004). Focus is on the value adding in the educational process and in identifying the main types of waste. Isaksson *et al.* (2013) define the educational process from perceived educational needs to when the acquired knowledge is used and then study causes for waste in this process. The main types of waste identified are waiting, inventory, overproduction and defects. Frontloading knowledge long before it is used is by Isaksson *et al.* (2013) classified as inventory, with the problem being that learning things well in advance will lead to great losses in the form of forgetting. There could be an advantage in learning things when they are needed – Just-In-Time. Because courses often come in fixed sizes without individual assessment of customer needs, overproduction is frequent. Course throughput is often well below 100 per cent, indicating a high level of defects.

Based on a customer focus on mature distance students – doing the right thing in the right way – we propose five criteria for net-based lean learning:

1. *Existence*: Does the required educational product exist?
2. *Extent*: Is the extent of it as required (overproduction)?

3. *Availability*: Is it possible to enter the education in a planned way? The course could exist, but not be available due to overbooking.
4. *Waiting*: When can the education be accessed (waiting)?
5. *Pace*: Is it possible to adapt the speed of learning (over-processing, waiting)?

The Criteria 1 and 3 are seemingly not part of the seven types of waste (Liker, 2004). These relate to the question: "Are we doing the right thing", which could be seen as a prerequisite for doing the thing the right way. Isaksson *et al.* (2013) define the end of the educational process to be when things learnt are put into use. We have limited the process to the end of the education. In Table I, the proposed parameters are combined with defined criteria for the different levels.

University distance learning in Sweden

The number of students attending distance courses in Sweden have increased over the years, until 2010-2011, see Figure 1.

Since 2011, the trend for number of students registered on distance courses is pointing downwards with the main reason for this being reduced course availability, see Table II and Table V.

To assess the number of applicants per course, we have combined statistics for percentage of applications with number of applicants and the number of places for the respective year, see Table II.

Table II includes calculated figures. The number of new students registered on distance in fall semester is based on the percentage of registered students in the fall season. The number of registered includes both new and previous students. An assumption is that we can use the percentage for total registered for new students as well. Results indicate that the number of applicants per place for distance has increased and that it successively has become considerably more difficult to enter distance courses.

Results from course search

We searched courses on www.studera.nu using the words lean and QM, recording total number of hits for courses and then for net-based education only. Because we chose to work with a limited topic, we also carried out a background search as comparison, see Table III. Results show that the topics of lean and QM have a higher percentage of distance courses.

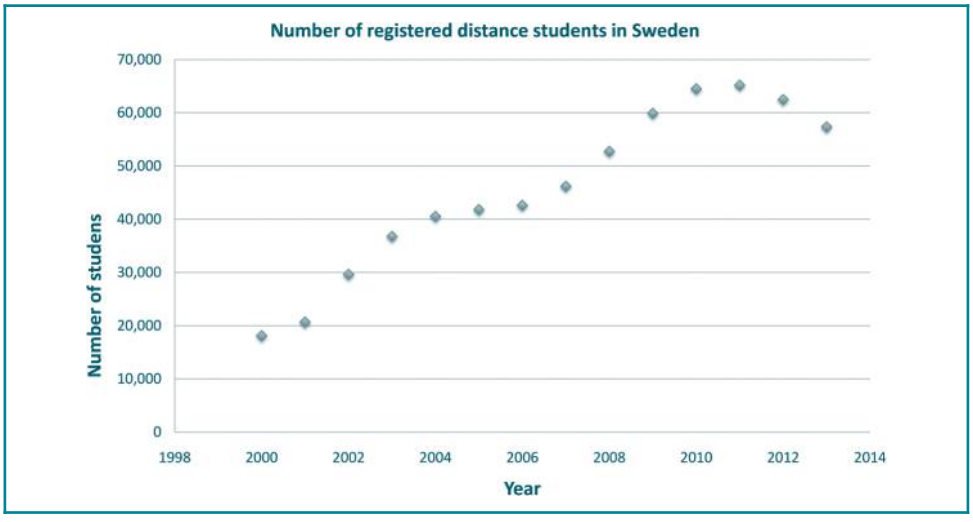
Figures for availability cannot be found on www.studera.nu, and we have, therefore, used input from Table II looking at the assessed number of places per applicant and specific information from Gotland University, see Table V and text below, to define the availability to present results in Table IV.

The arithmetic average rating in Table IV is 2.1 of 5. However, seen from a customer perspective, the situation is dominated by the low availability. A good offering is worth little if it cannot be accessed. There are many courses to choose from, and for QM, some different levels. The extent is mostly 7.5 European credit transfer and accumulation system (ECTS) or requiring about 200 hours of total study time, which is on the high side for many mature students who work in parallel to their studies. Waiting is a function of the educational system. There are two openings for applications yearly, which results in waiting being some three to seven months. The pace for QM courses can be chosen between 25-100 per cent of full time studies. There is little or no synchronisation between the offerings from different universities. Most courses are started in September or January and often in parallel with similar courses from other universities. The starting points are normally four per year, i.e. September, November, January and March. Of the total of QM and lean courses, only 11 per cent start in November.

Table I Proposed criteria for assessing the level of "Lean" in education

Criteria	*1*	*2*	*3*	*4*	*5*
Parameter					
Existence	Number course found	Some courses	Some courses at some different levels	Many courses at some different levels	Many relevant courses at many different levels
Extent	Courses of one extent only	Some variation in extent	Variation in extent	Some courses in the entire range from 1-30 ECTS	Several courses ranging from 1 ECTS and up
Availability	Very hard to access, > 5 applicant/place	Difficult to access 2-5 applicant/place	Medium access < 2 applicant/place	Good access; < 1 applicant/place	Guaranteed access
Waiting	Waiting > 6 months	3-6 months	1-3 months	< 1 month	Course can be started immediately
Pace	Courses with one pace only	Courses with some variation in pace	Courses ranging from 25-100%	Courses ranging from 10-100%	Several courses with fully flexible pace including intermittent learning

Figure 1



In fall 2013, Uppsala University Campus Gotland had some 5,700 persons applying distance courses within QM and Leadership, corresponding to almost 1,000 full year students. Of these, 11 per cent were accepted. This gives the rating of 1 as availability. Based on Table II, the number of applicants generally for distance courses is 2.8/place, which would indicate 2 as rating, but specifically for QM and lean, the example from Gotland University is believed to be representative and, therefore, 1 is chosen. Results of number of applicants for some example courses for Gotland University are listed in Table V.

The number of applicants over time indicates an exponential increase. Since 2009, the number of places on distance in Gotland University has remained the same or has been reduced. A further reduction is predicted. The new policy from Uppsala University Campus Gotland calls for a minimum 50 per cent increase of campus students maintaining a fixed total, which will lead to approximately a 50 per cent reduction of all courses given on distance compared to 2012 Figures.

Examples of lifelong learning from county councils

Another example of e-learning initiatives is the work carried out by the Swedish County Councils. These organisations' core business is health care, and they need to have a high level of efficiency, innovation and flexibility. Knowledge management is, therefore, a key methodology (Persson *et al.*, 2008). E-learning in the health care sector is emerging as a practitioner and research area. It might be defined as a method of delivering knowledge through diverse technological tools, such as web-based learning and virtual classrooms (Guidy-Olai and Tarn, 2012). Examples of workplace e-learning include interactive videos, games and virtual patient simulations for medical training (Dror *et al.*, 2011; Albertsson and Sundström, 2011; Guise *et al.*, 2012). Presently, around half of the 21 County Councils in Sweden practice e-learning to increase knowledge among adult employees or related organisations. These are characteristics of e-learning at the county councils:

- Educational content mainly covers hands-on topics directly applicable in daily operations, e.g. improvement of basic hand hygiene and fire prevention.
- E-learning content is made accessible mainly in the form of so-called sharable content object reference model (SCORM) packages, an industry standard for e-learning interoperability. These packages are interactive multimedia productions containing text, images, graphics, video or other media. One e-learning course is usually contained in one or many SCORM packages, depending on the course structure and length. These courses in turn are hosted on learning management systems (LMS).

Table II Data on number of applicants and calculated values for number of applicants per place for campus and distance

Year	Accepted (new) Fall semester (thousand)	Applicants (new) Fall semester (thousand)	Calculated total applicants/place	New distance applicants %	Calculated number of new distance applicants	Calculated new registered on distance	Calculated distance applicants/place	Registered on distance Fall semester	Totally registered Fall semester	Calculated % on distance
2001	182	269	1.5					20,662	3,00,669	6.9
2002	191	284	1.5					29,628	3,28,738	9.0
2003	194	292	1.5					36,771	3,39,893	10.8
2004	186	294	1.6					40,520	3,37,382	12.0
2005	181	290	1.6					41,795	3,30,875	12.6
2006	172	264	1.5					42,598	3,19,924	13.3
2007	191	292	1.5					46,174	3,19,120	14.5
2008	191	295	1.5	22	64,900	30,895	2.1	52,731	3,25,997	16.2
2009	226	360	1.6	24	86,400	37,920	2.3	59,898	3,56,987	16.8
2010	235	373	1.6	25	93,250	41,542	2.2	64,505	3,64,901	17.7
2011	243	385	1.6	27	103,950	44,248	2.3	65,171	3,57,907	18.2
2012	249	403	1.6	27	108,810	44,253	2.5	62,474	3,51,524	17.8
2013	242	413	1.7	27	111,510	40,160	2.8	57,331	3,45,473	16.6

Table III Results from www.studera.nu searching courses (not programmes) in total and the number of the total given on distance

Course existence in Sweden	*Lean*	*QM*	*Business administration*	*Programming*	*English*
Total number of courses	22	34	795	289	538
On distance	16	26	134	108	179
Percentage on distance (%)	73	76	17	37	33

Table IV Results for lean and quality management

Parameters	*Rating* 1	2	3	4	5	*Average rating*
Existence			L	QM		3.5
Extent	L	QM				1.5
Availability	L/QM					1
Waiting		L/QM				2
Pace		L	QM			2.5

Table V Number of applicants with first priority for distance courses in Gotland university

Course	*2002*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
Quality management 7.5 ECTS	34	22	22	45	55	64	68	145
Quality and organizational development 15 ECTS	26	31	40	42	87	78	126	300
Change management 7.5 hp					36	49	80	179
Leadership and coaching 7.5 ECTS					386	473	805	1,321
Leadership and group dynamic perspectives			44	98	85	179	289	534
Leadership and conflict management 7.5 ECTS			106	64	292	252	428	683
Leadership and organization 30 ECTS		114	89	115	291	277	429	567
Process management 7.5 hp		37	35	65		101	114	296
Project management 7.5 hp				83	304	340	352	844
Total	60	204	336	512	1,536	1,813	2,691	4,869

Source: Uppsala university campus Gotland starting 2013

Employees can access these LMS at a place and time of their own choice. Time for e-learning can also be allocated and scheduled for specific staff categories. Furthermore, e-learning can be used in combination with classroom education.

- The length of a complete e-learning education is typically 30-45 minutes.
- E-learning at the county councils is a relatively new phenomenon. The county councils that are most advanced in this area have been operating for 4-5 years, offering a 100 or so e-learning courses in various categories.

While e-learning is a fairly new concept in this sector, it is clear that the phenomenon is rapidly growing. It has been suggested that learning at schools should be influenced partly by workplace learning. Concretely, the on-the-job learning process is often of a collaborative nature and new knowledge can often be instantly applied in everyday working processes (Tynjäla and Häkkinen, 2005).

MOOCs on lean and QM

A search on courses for lean and QM on Coursera, EdX and Udacity results in only a few hits. Coursera has one course in operations management to offer, starting March 2014 and with no information on further courses. There is nothing on lean and quality in EdX and Udacity. All three are well-known providers of MOOCs. This means that so far there seems to be no real competition to what universities are offering within QM and lean for the adult learner.

Conclusions

The number of places for distance learning in Sweden is being reduced, while the demand is increasing. From the perspective of lean lifelong learning, waste is increasing. The lean-inspired assessment matrix seems to provide a reasonable first assessment. Results indicate that if availability could be increased the situation would improve considerably. Studying MOOCs, even if doing it in English, within quality and lean management does not currently seem to be an alternative. Examples from county councils show that practically oriented customer-focussed courses are being quickly produced for employees. This indicates that corporate e-learning such as at the county councils, is a cost-effective way of distributing learning and to increase the knowledge level of employees. Given that the alternative in many cases would be traditional face-to-face classroom education, e-learning can be produced at a fraction of the cost. Cost-effectiveness increases with the number of learners. Typically at county councils an e-learning course has a target group of up to 10,000 individuals.

Discussion

These results are surprising. With the discussions of MOOCs becoming a game changer and potentially a way to largely bypass universities, the expected reaction from universities would be to focus more intensely on distance education instead of winding it down. The direct reason for Swedish universities currently giving priority to campus education could be based on the interpretation many universities have made of governmental directives that seem to favour campus education. Also, for universities, it is easier to handle campus education where there is a long time commitment from students and, therefore, slower variation in demand, which provides economic predictability. For business in Sweden, the low level of lean for distance education is bad news, as voluntary individual competence development becomes more difficult.

An important aspect preventing innovation is the fact that the number of students allowed to attend is regulated based on the revenue from courses, and not the cost. This means that even if a university distance course could be developed to allow 1,000 persons instead of a 100 for the same total cost, this development is not carried out. The revenue would go over the quota of courses, which the university gets paid for by the state. Universities generally seem to be afraid of producing over the quota, as this could lead to questions from the authorities on the level of remuneration needed. Additionally, lecturers have little incentives on changing the way of education, as most universities focus on research. As long as there is queue of students for campus education, there is no perceived need of changing the traditional “sage on the stage” approach. This situation is unlikely to change until there will be an external shake-up, which could be in the form of customer demand going somewhere else with the help of modern technology.

From a company point of view, where the actual knowledge is in focus and not the university credits, it could be of interest to look at options of putting together own educational programmes based on existing ones on the net. This could be a version of the way in which Swedish County Councils work. It should be possible to patch together parts from MOOC-offerings into a customised course. Universities could still be a relevant alternative if only course availability was improved. Based on examples from Gotland University, it can be said that for 5-10 years ago, most students applying for distance courses were admitted. Currently, it is much more difficult to plan for attending on a specific course. For lifelong learning, it could be argued that guaranteed access for those with the required qualifications is the benchmark that would serve national interest in the best way. This could probably be done without too much expenditure by using modern technology and pedagogics as exemplified by MOOCs and courses given by Swedish County Councils. An area suitable for testing could be QM where there are many distance courses and where there is a high demand. The development probably could be sped up if companies applied stronger pressure on universities. A problem in Sweden could be that universities do not yet seem to be very customer-focussed.

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About the authors

Raine Isaksson, PhD is Senior Lecturer in Quality Management. He is teaching a variety of quality management courses, mainly on distance. His research interest is in process management and process improvement at a system level and with focus on sustainable development. He has a long engineering background within cement production, which also is an area of his research. Raine Isaksson is the corresponding author and can be contacted at: rainei@yahoo.com

Rickard Garvare, PhD is Professor of Quality Management at the Department of Business Administration, Technology and Social Sciences at Luleå University of Technology, Sweden. He has experience of teaching a variety of courses in the master and doctoral programmes. His present research efforts are focussed on adoption and implementation of quality-related methodologies, exploring causes to gaps between knowledge and practice mainly in health care related organisations and systems.

Mikael Johnson, PhD is Assistant Professor in business administration at CTF, Service Research Center and SAMOT – The Service and Market Oriented Transport Research Group at Karlstad University, Karlstad, Sweden.

Christer Kuttainen, earned the PhD in Electronic Commerce, from Luleå University of Technology. He works at the Norrbotten County Council, with implementing e-learning in the organisation. The County Council is a regional organisation for health and medical care. Previous research has a focus on e-commerce as well as e-learning, in particular among SMEs. Currently, he is involved in a research study of the role of interactivity in corporate e-learning.

Jörg Pareis, PhD is an Assistant Professor in business administration at CTF, Service Research Center and SAMOT – The Service and Market Oriented Transport Research Group at Karlstad University, Karlstad, Sweden. His main research interest is in value co-creation, customer experiences and the service environment. He teaches in Service Management, Marketing strategy and Customer experience on undergraduate, graduate and executive courses and currently leads a blended learning course developing project at the Karlstad Business School, Sweden.