Leagility in Education: Logistics and Supply Chain Management as a Dynamic Education Paradigm

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Abstract
The terminology of 'agile education', 'agile pedagogy', 'the agile classroom', has gained prominence in the literature in recent times. The concept of agile education emanates from the concept of 'organizational agility', which has been adopted and adapted into agile shipbuilding, agile logistics and supply chain, and agile software development, which, together with the concepts of Lean Thinking, which has its basis in the Toyota Way, are now being seen in combination, termed as Leagility. We seek to apply this terminology to education. The discussion is about the applicability of Leagilty in computer systems development education. The fundamental teaching and learning practices in computer systems education are practical and hands-on with theory following practice being more appropriate than practice following theory, and with theory practiced in-situ allowing the emergence of theory based on the practice in an inductive manner. This paper is a discursive discussion, based on personal experience and perceptions gained from 50 years of involvement in the tertiary education sector, both as student, and academic teacher and researcher, and concurrent or other experience as an IT/IS practitioner, to project management level. The proposal is to radically overturn the current educational model, and implement a hands-on, practical, 'super-project' as the primary learning vehicle, and incorporating a paradigm of continuous and formative assessment, student learning teams, teaching teams, and curriculum design and development, to overcome the perceived 7 Wastes of Education, based on the 7 Wastes of Production, from the Lean Thinking model derived from The Toyota Way of Management. (Morien, 2016a, 2016b, 2017, 2018)

Keywords: leagility, 'agile education', 'agile pedagogy, education logistics, lean education, lean management.

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Introduction

The concept of agile education emanates from the concept of 'organizational agility', which has been adopted and adapted into agile shipbuilding (Moura & Botter, 2012)), agile logistics and supply chain (Naim & Gosling, 2011), and agile software development (Poppendieck, 2001), which, together with the concepts of Lean Thinking, which has its basis in the Toyota Way (Liker, 2004), are now being seen in combination, termed as Leagility. We seek to apply this terminology to education.

The thesis in this paper is that universities and colleges (referred to here, generally, as Higher Education Institutions, or HEIs) seem to be becoming endangered institutions, certainly in their current form, in many of the academic disciplines, and a radically different view of the Pedagogical processes is required: proposed here as a Logistics and Supply Chain Management view.

Qutoing from tn the Thailand Nation Newspaper of 16th September, 2018 *"The president of a famous university in Japan ..."We have no illusion about our future. We may have been a top-ranked university for several decades... in the current ecosystem, past success doesn't guarantee future success. No institution is too big to fail."*. This is certainly not the only statement on the perils facing HEIs to be found in the press and the research literature. (Isaksson et al., 2013)

The solution is seen here to be a new model of HEI pedagogy that considers HEIs as competitive, commercial enterprises whose education processes are appropriately seen as being akin to logistics and supply chain processes. (Doman, 2011). The computer industry, in all its manifestations, is the example high in our minds, and the authors' experience in higher education, over the past 50 years, and in computer systems education over the past 30 years, allows us to consider this academic area as an indicative case.

Most, if not all, current Logistics and Suppy Chain Management practices can be valuably applied to education: Quality Management, Quality Circles, Supplier Networks, Just-in-Time manufacturing, eradication of waste in the manufacturing processes under the heading of Lean Management, adaptability of processes under the heading of 'organisational agility', with these latter two approaches now being combined under the heading of 'Leagility'. (Emiliani, 2014)

To set the scene for these proposals, a quick definition of each of these three terms is appropriate. In general terms, 'agile' means *"fast, quick decision making and behaviour to meet changing circumstances, implying timely decision making"*. Lean, or Lean Management, is stated as *"get the right things to the right place at the right time, the first time, while minimizing waste and being open to change"*, and, finally, 'leagility' is a combination of these terms, to imply *"overall efficacy, effective and efficient, behaving in an agile and lean manner"*.

Continuing this notion, we state the concept of "pedagogical agility" by applying "agility" to the definition of "pedagogical agility": *"The capability of an HEI to rapidly change or adapt in response to changes in the market for Graduates. A high degree of pedagogical agility can help an HEI to react successfully to the emergence*

of new competitors, the development of new industry-changing technologies, or sudden shifts in overall market conditions".

Further, in the HEI situation, we define "Leanness" as developing a pedagogical value stream to eliminate all waste, including time, and to ensure the continuous and levelled delivery of a schedule of knowledge enhancement. *"A lean HEI understands knowledge value and focuses its key processes to continuously increase it. The ultimate goal is to provide perfect Knowledge to the student through a perfect value creation process that has zero waste".*

Similarly, "Leagile" is a hybrid of lean and agile systems, and a paraphrased definition, derived from http://www.husdal.com/2009/05/28/lean-agile-leagile/).is *"Leagile has emerged as an answer to the problem of reconciling long curriculum lead times with unpredictable demand".* These definitions of Logistics, and Supply Chain Management, drawn from the Internet, have been modified to be applicable to HEIs, particularly by refering to 'students' rather than 'customers', extending this to include future employers, students' families, and society at large as stakeholders in the education process. The "product" can be defined as being 'Knowledge", or, to give it a more 'production line' relevant identity, the product being produced by HEIs is **a Knowledge Product** constituting the entirety of the knowledge gain designed into the 'production line' activity by way of the sub-assemblies, parts and components that we refer to as **Knowledge Units**, or, in simple terms, curriculum components.

By separating the idea of a Knowledge Product as what is being produced on the HEI education production line, and not the student or graduate as the product, allows the idea of the students themselves being active production line process workers, together with their teachers and other curriculum providors and participants. It also allows the Knowledge Product to be seen as the product that is designed, and produced by a process of adding sub-assemblies and component parts, which we term Knowledge Units, at conceptual work stations, which in today's conceptualisation is essentially the subject taught in a semester.

In Isaksson (2013), the scenario now facing individual universities includes significant competition from many different sources, with courses being available from 3rd party online providers, and the Internet enabling the extensive availability of e-learning materials, the most illustrious of which are so-called Massive Open Online Courses (MOOC's) offered by prestigious universities and world-leading lecturers, online. Udemy offers many and varied online courses, and it seems that this is a low-cost source of academic material, competing for enrolments, thereby being competition for traditional providers of educational material (https://www.udemy.com/). Our experience in selecting textbooks for subjects over 3 decades includes seeing offers by textbook publishers to provide a complete, 'canned' curriculum, requiring the teaching academic merely to set up the projector and present the slides provided. Confronted with these situations, together with the extraordinary developments and advances in computing, information technology, and communications technology, by huge organisations such as Google, Amazon, Microsoft, Tesla, and Facebook *inter alia*, one can only wonder at what HEIs can, and must, do to remain viable and relevant, even to continue to exist in anything like their current form.

Discussions published in many papers on or around this scenario seem to mostly be concerned with improving the efficiency and effectiveness of the operational and administrative processes of HEIs as they currently operate (Doman, 2011), and do not address the actual education processes; the pedagogy. In our view. HEIs must make radical changes to their academic systems, what we term here their Pedagogical Systems. New ways to source curriculum materials, new ways to present those materials to students, new ways for students to access that material and learn, and new ways to assess the learning outcomes, are required. It cannot be a mere reorganisation of current processes, but a radical change in almost every aspect.

Overall, it is suggested here that a new HEI pedagogical model is needed, and in this paper, we present such a model that defines the Pedagogical System of HEIs as a Logistics and Supply Chain Management model. To support this proposition, a new, more commercial view of education is needed.

Systems in Higher Education Institutions (HEIs)

It is suggested that there are three different but associated systems in an HEI:

1.   **The HEI General Administration System**, which includes all of the general administrative functions necessary for the HEI to continue operations. These functions include HR Management, Payroll, Purchasing, Accounting, Budgeting, and so on. Clearly, these are candidates for 'lean analysis', and are the typical systems considered when discussing the application of lean thinking in an enterprise.

2.   **The Education Support System**, which we define as including all of the administrative functions necessary for the university to accept students, enrol students, organise teaching timetables, control student enrolments in subjects, handling fee payments, recording examination results and grades, appeals against assessment, controlling graduate research and dissertation submission, and can also be seen to include the decision making processes for offering new courses and subjects, and deciding on curriculum. As essentially administrative, the Education Administration System is also clearly a candidate for 'lean analysis'.

3.   **The Pedagogical System**, which we see as including all of the processes and activities involved in designing curriculum, sourcing, developing and presenting the curriculum to the students, making learning materials available to students, the learning activities of the students, and the assessment and evaluation activities necessary to monitor student progress and to monitor the quality and success of these processes. So anything to do with Teaching, Learning and Assessment are included in the Pedagogical System.

It is this system, and all its components and activities, that we see as being of particular relevance when considering 'agile education' or, also terms used in the literature, 'agile classrooms' and 'pedagogical agility'.

In the discussion in this paper, the possibility of applying both lean and agile principles and processes to HEIs is considered, and applications of these under the heading of 'leagility' are proposed. In our literature review, we identified numerous papers with titles indicating that the topic of the paper was 'the lean paradigm in

higher education'. These 'lean' papers seem predominantly to address the General Administration System processes and the Education Administration System processes, but seem to say little about the Pedagogical System. However, there is also a plethora of papers indicating by their title that they are addressing 'the agile paradigm in education', with the keywords of 'agile education, 'the agile classroom', and even 'agile pedagogy'. These 'agile' papers are more considering the Pedagogical System, rather than the General Administration System or the Education Administration System of the HEI being discussed. As has been indicated in many papers, particularly in the logistics and supply chanin management literature, 'lean' and 'agile' usually are not applied separately and in the absence of the other. Thus the derived term 'leagility'.

Considering the Pedagogical System as a Logistics and Supply Chain Management Problem

Many papers have been published on the subject of 'Leagility in Logistics and Supply Chain Management', identifying the process environment to which lean practices are best applied, and those to which agile practices are best applied. It is not too difficult, given an appropriate set of definitions appropriate to the actors in, and dimensions of, the Pedagogical System in an HEI, to define this system and its processes in terms of being a Logistics and Supply Chain Management situation.

We are aware of the classical attitude towards education, referred to in Emiliani (2004) in these terms: *"Administrators, faculty and staff* (in higher education institutions) *must avoid the trap of viewing higher education as a special case where Lean does not apply. People not encumbered* (by this view) *... accept that students are customers"*. We, the current authors, have been avoiding this trap for many years, holding as we do the opinion that education in HEIs cannot be the 'ivory tower detached from the real world' style, and must provide job skills, organisational 'social' skills, problem-solving skills, know-how, as well as know-what and know-why as well as subject matter expertise. As we wrote as far back as 1994, *"It is obvious that the education of IST professionals at tertiary level must be broad. Just to teach technical and narrow skills is futile. However, there does appear to be a significant demand for specific skills in certain areas."* (Morien & Schmidenberg, 1994).

A commercially-oriented model where students are the customers of the institution, as has been suggested in Emiliani (op.cit) is a reasonable model of education consumption. After all, as students pay to attend the institution, it can be suggested that they are paying for a service, therefore they are the customers. The provision of education is a multi-billion-dollar industry, ranking high in the importance scale of export industries. In 2017, fees alone paid by foreign students exceeded AU$11 billion. Clearly, HEIs are commercial enterprises operating as a competitive, commercial industry.

As discussed above, we define the pedagogical process in terms of being the activities involved in the development of a Knowledge Product. Within this process, Knowledge Units are added to the evolving Knowledge Product, which is the work-in-progress. These Knowledge units are the knowledge parts and sub-assemblies being applied to the build of the Knowledge Product. By separating the students from

the Knowledge Product, we can see the student as also being a knowledge providor by virtue of their research, self-directed learning, and general realisations.

The Pedagogical System

Taking from the definitions above, this system can be defined as *"a value chain extending from secondary schools and other sources of student entrants, and includes all aspects of the development of a knowledge product sufficient to produce competent, well-educated graduates to meet the requirements of employers and other stakeholders in society"*. It includes all aspects of the processes of teaching, learning, and assessment, including curriculum design, development or sourcing of curriculum, and interfacing with the suppliers of curriculum".

A well defined and conducted Pedagogical System maximises value to the stakehoders, particulary employers, by producing a graduate with the best set of skills and know-how and a service mind: the Knowledge Product, thereby creating a competitive advantage in the education marketplace, using information technology to advantage in the support and control the teaching, learning and assessment practices in the system, as well as the efficient and effective presentation opportunities of e-learning and other information technologies.

The 'Graduate' as the Product

While the graduate is the visible and obvious finished product of the Pedagogical System, it is more relevant to view the totality of the graduates knowledge gained over the course of their study to be the Product, and refer to this as the Knowledge Product. This Knowledge Product comprises a set of Knowledge Units presented to the student, which is referred to in the next paragraph.

The 'Student' as the Work-in-Progress Product

The student, or more particularly the student's Knowledge Product, is the partially assembled (partially educated, partially complete) work-in-progress, moving in an orderly fashion, from Knowledge unit to Knowledge unit (perceived in this context as equivalent to moving from workstation to workstation, and having parts and sub-assemblies added in a manufacturing process), and being transformed step-by-step into the finished product; the Graduate's Knowledge Product.

Knowledge Unit

We use the terminology of 'knowledge unit' as being, first, the essential 'sub-assemblies' or 'parts' being added to the Student's Knowledge Product, and also to move away from the traditional notion of a subject which is a 16-week course in a semester with final examinations deciding whether the student has passed or failed overall (too little too late for the student to be assisted). The experience of the student in the system, together with the inclusions in the specific curriculum represented in knowledge units, gives the graduate the many essential soft skills necessary, ensuring that they are indeed well-rounded, well-educated products of the Pedagogical System of the HEI.

Knowledge, and more particularly Knowledge Units, is, are, the 'raw material, component parts and sub-assemblies' in the Pedagogical System processes. First, the secondary school graduates or mature-age entrants, when they enter the HEI system, bring with them knowledge, gained from their schooling. During the Pedagogical System processes, their knowledge is extended, advanced, evolved by studying further curriculum, presented to them in specific, discrete but associated 'Knowledge Units'. This is achieved in a continuous, longitudinal, 'production line' process. These Knowledge Units are either produced internally or sourced externally from curriculum suppliers. As referred to above, MOOC's that are currently available via the Internet, and courses from suppliers such as Udemy, as well as 'canned' courses from textbook publishers, interesting videos published on YouTube, and any teaching and learning materials published in-house, can be organised into a learning process in which they are considered as the raw materials, parts or sub-assemblies in the Pedagogical System during which the final product, the Graduate, is built..

A Knowledge Unit can be a 2-week intensive classroom or seminar situation, or an online e-learning video series, or an entire MOOC presentation, or YouTube video. This definition provides the freedom to deliver curriculum content, or knowledge, in a variety of ways, and which can be sourced from anywhere, or developed in-house. Also, by offering knowledge units online, with AnyWhere/Anytime access, students remote from the university, or just in remote locations, can access the content, thus pursuing their course in their own time, at their own location.

Quality Assurance and Quality Control

Although not specifically stated in the definitions given above, QA and QC measures and processes are applied to the evolving product (the student's knowledge) on a regular and continuing basis by virtue of assessment and evaluation processes, which include examinations, pop-up tests, teacher reviews, peer reviews, with the production process coming to an immediate stop when the product-in-process (again, the student) fails the quality tests. As well, close scrutiny of the curriculum included in the knowledge units is an essential element of the QA and QC, in exactly the same way that materials used in the manufacturing process are tested for usability and fitness-for-purpose. Production line elements of Quality Circles, TQM etc., applicable in Logistics, are relevant here.
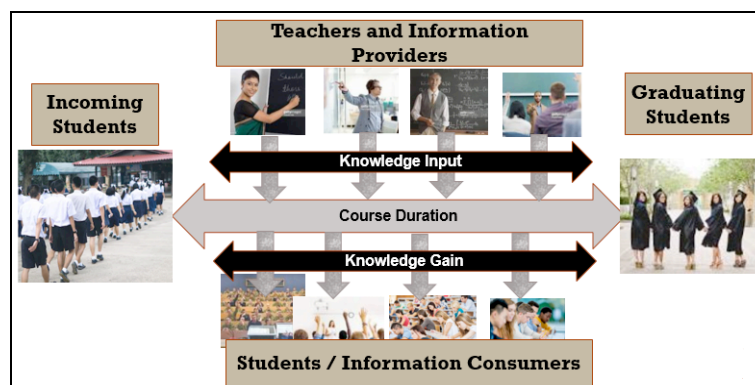

Figure 1: A View of the flow of students through the Pedagogical Production Line

In Figure 1, we see a simplistic view of the Pedagogical System, with incoming students entering the HEI, proceeding through a Course, gaining knowledge along the way, with that knowledge primarily provided by teachers and some others, to ultimately produce a graduate. However, this is hardly a nuanced picture.

Figure 2: A representation of the Pedagogical Logistics and Supply Chain System

In Figure 2 we see a more complex representation of the Pedagogical Production Line, but still representing students as the product.

In Figure 3, the development of a Knowledge Package as it proceeds through the pedagogical production line is envisaged.
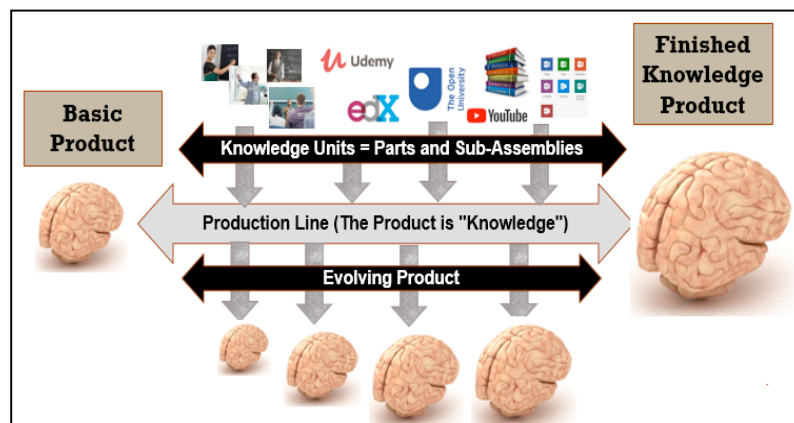

Figure 3: The "Product" of the Pedagogical System is "Knowledge"

One useful outcome of defining the product as a Knowledge Product, and not as the student or Graduate themselves, is that the students can now themselves be seen as Knowledge Providers, bringing Knowledge Units into the production line by way of self-learning, research and their own evolving 'realisations' and knowledge gain. Figure 4 illustrates students as participants in this manner.
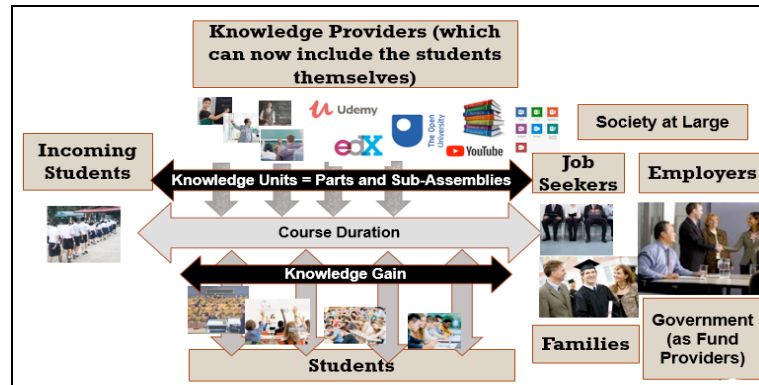
Figure 4: The Stakeholders (with Students as both Learners and Knowledge Providers)

The Seven (Now 8) Wastes of Manufacturing

We now consider Lean Thinking, as applicable to Logistics and Supply Chain Management, which we then transfer into the education environment, in the Pedagogical System.

First, elimination of waste in the processes in any organisation is the most effective way to increase the profitability of any business. Processes either add value or waste to the production of a good or service. The seven wastes originated in Japan, where waste is known as "muda."

The 8 Wastes of Education

Various attempts have been made to redefine the 7 Wastes of Manufacturing into the education context. Various efforts have been made to transform the wastes of manufacturing into the wastes of education. Isakson et al. (2013) presents a model of the types of waste appropriate to education, Inventory is defined as "Frontloading or storing of knowledge which is supposed to be used much later". Overproduction is stated as "(Graduates) without employment opportunities", which in our model would be better considered under Defects.

Figure 5 is our attempt at defining the 8 Wastes of Education, It is a little different to our original model published in (Morien, 2016) which attempted to precisely match the terminology of the 8 Wastes of Manufacturing.

Type of Waste	Explanation
Overproduction	Extra and unnecessary curriculum and 'knowledge' that is not useful or useable. This may include curricula which is the specialty of a particular academic, but does not fit into the overall scheme. Also, curriculum and teaching materials that are developed in-house that could be cheaply and quickly sourced externally, i.e. produced unnecessarily, therefore consuming resources, or requiring extra, unnecessary resources.
Waiting	The 'knowledge' gained by a student, and the understanding of its relevance, must be 'kept on hold' until it is useful and useable in a subsequent part of the Pedagogical Process, which tends to be forgotten or become irrelevant with the passing of time.
Transporting	Knowledge must be carried, or transported, from one subject to another, which may or may not be consecutive in the pedagogical process, potentially resulting in that knowledge being forgotten or superseded, thereby indicating that it was a waste of time and resources to present that subject in the first place, or requiring that it be taught again, resulting in duplication of effort and resources.
Inappropriate Processing	Teaching and Learning methods that are inefficient or ineffectual. We consider classroom teaching to be an example of this, in many circumstances. The 'chalk and talk' approach to knowledge presentation is certainly seen as now being an obsolete and inappropriate process.
Inventory	Concepts, ideas, specific knowledge that must be 'stored' (i.e. remembered) until it can be used at future time, and which is often forgotten, or becomes obsolete.
Unnecessary / Excess Motion	This is envisaged as students continually moving from one subject to another, intellectually (not physically), needing to apply knowledge gained in one subject to another subject, as well as the usual situation of moving from one academic area (perhaps programming) to another often unrelated subject (perhaps statistics or analysis methodologies), thus breaking the overall coherence of the student's studies, in the short-term.
Defects	Shallow learning, forgotten subject-matter, failure to comprehend subject-matter, leading to cheating, copying, plagiarism, as well as inappropriate curriculum
Recognition of Staff	An additional 'waste' from the original seven, indicating failure to recognise and acknowledge staff abilities, accept staff suggestions, develop staff, as well as failure to introduce external consultants and experts on an ad hoc basis. In the education environment, 'staff' must include all faculty, as well as students, who are also stakeholders in the process.

Figure 5: The seven (now eight) wastes, applied to Education

The Need for a Radically Different Pedagogical Model.

The concept of viewing the Pedagogical System of an HEI as a Logisitics and Supply Chain Management System, in the way that we have done here, suggests how the process can proceed, with the availability of Knowledge Units being added to the Knowledge Product, addressing the stakeholders in the system, and so on. Our further discussion is about the many and varied methods and tactics that can be utilised to successfully build the Knowledge Product: these are the Pedagogical Methods that have been proposed elsewhere in some profusion. These methods include "The Flipped Classroom", "the Agile Classroom", "Project-Based Learning" and so on. We label these the production line processes and work station activities of the production line, whereas we are considering the overall supply chain.

The fundamental problem perceived in most of those proposed methods, sometimes termed Unconventional Methods, have mostly appeared to be proposals for making the classroom situation more effective. Our proposal is to radically overturn the current educational model, remove standup classroom teaching as the primary mode of subject matter delivery, extensively utilise modern communication and other technology for the provision of curriculum; the Knowledge Units, and to seek to achieve a significantly higher standard of knowledge acquisition achievement than is currently the case.

This can be envisaged as a continuous learning stream based on a broad front of teaching and learning of particular and closely related curriculum, rather than the siloed, almost bits-and-pieces of curriculum that may or may not be immediately related and useful, and is intended often to be 'pre-requisite' learning for subjects remote in time, at soonest in the next term, and often a year hence, by which time the subject matter may well have been forgotten. One way or the other subject matter that

is immediately unrelated and not useful *in situ* does not present the same learning urgency as when it is immediately applied.

Just-in-Time Curriculum

Our suggestion as to the overall teaching and learning strategy is to base the computer systems deveopment course (in this case) on an industry-strength project developed over the whole course. Curriculum decisions will be based on the Just-in-Time curriculum requirements for the continuing development of the project, rather than on the long-horizon, batch style curriculum development extant in HEIs.

Continuous Production: No Waiting

The "production line" scenario for students is a continuous learning stream continuing from one Knowledge Unit to the next, sometimes with Knowledge Units in parallel, sometimes in a single Knowledge Unit. The content of each Knowledge Unit will provide knowledge that is directly relevant to the next Knowledge Unit without Waiting, without On-Hand Inventory. In the "super project" approach to teaching and learning, the knowledge included in each Knowledge Unit with be immediately applied to the project, providing immediate "hands-on" reinforcement and deep learning of the knowledge. Over time, the project will be extended to introduce new knowledge, and also to cotinue the reinforcement of prior learning.

Quality Control and Quality Assurance: Assessment of Knowledge Gain

Continuous, longitudinal, formative assessment will confirm continuous learning success, which contributes to the students' sense of well-being and satisfaction, and enjoyment of learning. The ever-present problem of shallow learning and forgotten information is overcome to a great extent by this approach. Assessment is a multi-dimensional process, relying on teacher assessment, peer-assessment, self-assessment, frequent testing supported by online apps, all with the intention of providing educators with continuous information on student progress to enable Just-in-Time assistance to enable student to demonstrate a level of knowledge acquisition at close to the 100% mark. Concepts of Quality Circles (The Economist, 2009, Harvard Business Review, 1985), can be applied, as can the concepts of Total Quality Management (TQM) (Goetsch & Davis, op.cit)

Minimally Sufficient Relevance

The concept of Minimal Sufficiency is best stated as "All that is necessary, but no more than is necessary". Adding too much to a product beyond the necessary functionality may be seen as desirable, even marketable, but in many ways it is a waste. To achieve a minimally sufficient Knowledge Product, careful consideration of relevant curriculum is essential. A significant problem in course design, under the usual bureaucratic requirements of the Education Administration System, is that course designers are required to foresee and prophesy requirements 7, perhaps 8 or more years from the time that a decision is made to consider curricum content. In the proposed approach of having an evolving "super project", requirements can be added in a Just-in-Time manner, right up to the penultimate semester of the course, thus ensuring greater contemporary relevance. To label the current approach to curriculum, it may well be seen as a Just-in-Case approach, including curriculum that might be

relevant in 7-years' time. As well, extra curriculum which is not contemplated in the group wisdom of the curriculum designers is not taught, reducing the wastefulness of "Inappropriate Processing", "Inventory", and "Defects".

Conclusion

Careful retrospection of the experience of 50 years in the HEI environment, man-and-boy, so to speak, has lead us to the conclusion that education delivery has substantially failed to keep pace with industry advances, especially in the computer systems industry. Nor has it kept pace with educational technology, in many cases by having, so far, not taken great advantage of the marketplace for education-support software. HEIs are now essentially commercial enterprises, offering a product for sale (knowledge), in competition with other like-minded HEIs. The delivery of 'knowledge' to students, with the ultimate result of producing a graduate as the final product, has been envisioned as a Logistics and Supply Chain Management problem, that can be made more efficient and effective, therefore more competitive in the HEI industry, by Lean and Agile processes which, together and appropriately applied, are now being termed Leagility. As an essential uptake in manufacturing Logistics and Supply Chain Management, the Internet, the communication capability enabled by that, the communication software and technology now readily available, the education support software of Learning Management Systems etc., are also drivers for a new-look Pedagogical System based on Logistics and Supply Chain Management concepts, practices and processes.

The proposed 'production line' of Knowledge Product, as partially completed, work-in-progress product, can therefore be designed to be dynamic, quick to grasp new opportunities (which in some cases means fast changing curriculum to meet the dynamic changes in industry), ensuring a quality Knowledge Product.

All of the Wastes of Education can be overcome, or at the very least mitigated, by having a lean and agile Pedagogical System, with substantial hands-on skills acquisition, together with soft skills of teamwork, creativity, problem-solving and the development of a service mind.

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