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## Abstract

Modular course architectures have been widely used as a means of developing, managing and delivering courses in higher education for many years. In particular they are often adopted as a potential means of enabling faster and more flexible design and development of new courses, thus helping institutions to meet the demands of an ever more changeable market populated by an increasingly diverse range of learners whilst at the same time allowing economies of scale to be realized at the module level. The growth of e-learning has added impetus to this argument by holding out the possibility of re-using modules in a number of different delivery contexts and exploiting markets which might not otherwise have been viable. This paper analyses these arguments for modularization and suggests that there may be limits to the extent to which modular course architectures can deliver the potential gains which are often attributed to them.



## Key words:

Modularization; course architectures; e-learning; efficiency; economies of scale; economies of scope

## Introduction

Developed societies face an economic conflict between wanting goods and services supplied as cost-effectively at possible and the instant availability of a very wide a range of differentiated products and services. Add to this the expectation of increasing levels of quality and reliability, a constant drive towards innovation and an increasingly diverse consumer base and we begin to identify some of the tensions which organisations serving the market face in the current climate. Higher education is not immune from these basic tensions. The extension of participation in UK higher education of 18-22 year olds from a small elite minority fifty years ago to over a third now plus widening participation of "non-traditional" student groups has created the demand and need for a much more differentiated provision. The rapidly changing structure of advanced economies has resulted in employment demands for a wide range of very different graduates. At the same time the cost of providing this level of variety at high quality and responsively to so many has put stress on our collective ability and willingness to resource the education system.

The issue is further compounded by the rapid pace of technological and market change. Product life cycles are now much shorter than at any time previously and this has put pressure on producers, including universities and colleges, to shorten the time it takes to design and "productionise" new offerings. The ability to gain sustainable competitive advantage through time compression techniques is an important competence for many successful organizations. New business models have emerged which are dependent on the rapid introduction of new products, whilst, at the same time, satisfying an almost

unlimited demand for variety at affordable prices. Prime examples include new competitors in the fashion industry, the development of build to order systems in the personal computer industry and the very rapid turnover of products in the financial services sector. Again higher education has taken note and is beginning to understand that market pressures from both potential students and employers will require course development processes to be leaner, faster and more responsive without sacrificing quality (see, for example, Swain, 2008).

This paper analyses one approach, commonly known as “modularization”, to resolving some of these tensions. The key feature of modularization for the purposes of this paper is the sharing of modules between different groups of students and instances. In that sense modularization is an approach to the development and delivery of higher education services which has at its heart the use of common components across completed end-user products. These modules may be self-contained elements of a course or may themselves be components of a self-contained element which forms part of a course. There are other terminologies, for example “units” and “programmes”, but the core feature is the same: sub-component A can be used in final product X, Y and Z. Put as simply as this the attraction of a modular strategy becomes obvious; it should be possible to satisfy the demand for variety at the course level by producing a relatively small number of modules. In doing so we can, in principle, reduce costs by sharing modules between products thus creating levels of module demand large enough to allow cost-effective production.

This paper does not enter into the lengthy debate over defining "e-learning"; it is taken to be a general term embracing the application of digital technologies to the design, production and delivery of the curriculum and end-user applications. The rapid growth in capability and affordability of digital technologies has opened up the realistic possibility of universities extending their core businesses without necessarily having to work within the constraints imposed by their physical campuses. This paper deliberately invokes the language of business to ask whether higher education can learn anything from a more general consideration of the concept of "modularization", a term which is used widely outside education as well as within it.

**Modular architectures**

In simple terms a modular architecture can be seen as a set of modules and components from which designers can choose to design and build a proportion of a complete product or service. In education the more usual term for this is "modular system" but this can lead to confusion with "module system" which is defined below. At the design stage modularization is aimed at promoting the interchangeability of sub-assemblies or systems within a given architecture. The most common use of the term 'module' tends to refer to a set of components, which are sub-assembled before being co-located in the final product, for example the mother board of a personal computer. A common foundation year shared between a set of courses is a well known example from education. However it is more helpful to think of a grouped set of components as a 'module system in order to avoid the inevitable ambiguity that arises between use of the term 'module' to describe both a component of another larger module and the larger grouping itself (for example, a

module within a foundation year and the foundation year itself). A module system can comprise a single component.

However, module systems can provide for specific functions but need not be co- located in the product. The braking system in a car is a familiar example. Examples from course architectures include blocks of components covering particular aspects of the curriculum, such as entrepreneurship, communication or study skills. Module systems are groups of components which share a function or functions. The important part of defining the boundaries of a module system is that there should be little dependency between it and other systems. Clearly if two components are totally dependent on each other, in the sense that the functions of one cannot be fulfilled without the other, then they are essentially components of the same module system and need to be considered as an entity. One consequence of adopting boundary definitions of this sort is that the interfaces between modular systems and the ways in which they are managed effectively become critical for success.

In an educational setting it is useful to think of module systems from a functional perspective. Foundation years are often justified in terms of their functions in establishing a shared intellectual and knowledge base on which to build further study rather than the fact that they all appear in the same block of time. Core or mandatory module systems are used to ensure that minimum levels of proficiency or knowledge or commonly agreed "standards" are met. In general terms "modular architecture" describes a low number of functions per component, while "integral architecture" describes high numbers of

functions per component. Complexity costs tend to be higher with integral architectures, although coordination costs can be higher with modular architectures. Integral architectures tend to be used in situations where the product is highly specialized and there is supposedly limited scope for making use of existing components or indeed sharing components developed for a particular application with other products. “Limited scope” is sometimes defined in economic terms, that is component sharing might be technically possible but it would not result in net benefits at an organizational level. On the other hand coordination costs between module systems should not be underestimated. In particular, for example, course designers should be wary of simply assembling new courses out of existing modules without paying attention to what the totality of the course looks like to students and what it is intended to achieve at the course (rather than module) level.

In design and production terms, modularization is a means of sharing components or functional collections of them across products. In principle, the modular approach greatly simplifies the complexity of developing products, and makes it easier to switch scarce resources between products and at the same time exercise tight cost control. Modularization is also frequently justified in terms of specialization. If no single organization can, or find it economical to, embrace all the skills, competences, knowledge and resources to design and produce a complex product, then there is case for suppliers to emerge who specialize in particular components or modules. Such modules can then be incorporated in a wide variety of final products sometimes marketed by competing sellers. This tendency has become even more marked as products and services

or integrated combinations of them combine more and more complex technologies and exploit a wider range of diverse knowledge bases. Often the technologies required in many design and production situations have been developed outside the existing core knowledge base of the organization combining them into their products. Examples include the application of electronic systems (telematics) in automobiles..

However modularization is more than a methodology for design and production. It is also a strategy for providing a high degree of product differentiation to suit individual needs, shortening lead times to market for new products, keeping costs down and providing the agility to cope with rapid shifts in customer demand in the face of changes in market environments, for example the switch away from 4x4 vehicles to hybrids in the face of environmental concerns, higher fuel prices and shifts in the tax regime. Modularization is one component of a business model which also includes shifts in the responsibility for design, development and sub-assembly of module systems to trusted suppliers, disaggregation of the value chain into design, development, quality assurance, production, distribution and customer support elements which are not necessarily combined within a single organization (which they are, for the most part, within universities) and much higher levels of vertical and horizontal collaboration, both within and across organizations, than has historically been the case.

**Knowledge architectures**

The discussion so far has been in terms of modularization as an approach to product architectures (the construction of courses) and process architectures (the way courses are

developed). Arguably these are less important facets of modularization (and much less interesting from an education industry point of view) than knowledge architectures. 'Substantive knowledge' is knowledge about how a product is developed and produced and is therefore essential to producers. Users do not require this knowledge since it is embedded in the product itself. In this case the category 'users' not only includes end-users but also producers of final products who include modules from other sources in their own products. What is required in such cases is knowledge of what the module does (its functions) and how it can be interfaced with other modules.

'Functional knowledge' is knowledge about the functions, applications and current uses of a module and is, therefore, essential to anyone who wants to incorporate the module into their own product. It may also be essential to end-users. In the case of so-called 'white box modules' the user holds almost complete substantive and functional knowledge of the module. Of course, even if the assembler had all the substantive knowledge to produce a module, he might still choose to outsource it for economic reasons including the potential for suppliers to be able to exploit greater economies of scale in production by producing for a number of buyers.

'Black box' modules are those where the assembler cannot produce them on the basis of substantive in-house knowledge. In this case outsourcing is the only option. Whilst this might appear an unlikely scenario in higher education, the proliferation of courses which combine a number of specialist areas of knowledge in new contexts may create needs and opportunities where black box modules could have clear benefits. For example, the

spread of courses in areas such as sports studies and equine studies, often in smaller institutions without a wide discipline base on which to build, may be made easier and more effective by the availability of modules in areas such as physiology, law or journalism. Often such modules are provided within the framework of collaboration between institutions rather than on a free market basis; but the principle that black box modules can be deployed to the benefit of users, including students, is reflected in practice. In simple terms this division of knowledge has parallels with the more familiar concept of division of labour. Just as the division of labour has traditionally allowed cost gains to be made from specialization, division of knowledge allows dynamic benefits to be derived from the exploitation of product development competences. Or at least that is the conventional argument.

In practice some modules will fall somewhere in between ('grey box'), that is be ones where the user has some substantive knowledge about the module but not all of it. Of course users may be very wary of black box modules since this would transfer some power to the supplier and may result in higher prices being charged. Clearly modules can move from being black box to white box as the knowledge they embrace becomes more familiar and available to users. Equally clearly one organization's white box may be another's black box.

The design and development of a complex product can normally be broken down into a series of tasks. Tasks are 'similar' if they are based on the same substantive knowledge; the execution of similar tasks is a major source of economies of scope. Economies of scope arise when knowledge and competences are deployed to produce a wider range of

related products more efficiently than they might otherwise be. Examples from education include quality assurance systems, expertise in assessment management and the right to be able to offer recognized and valued awards within a generic framework. Economies of scale arise when the production of greater volumes of an identified product (for example students taking a given module) lead to lower unit costs. Economies of scale are closely associated with the idea of division and specialization of labour rather than the exploitation of specialized knowledge. An extended analysis of the distinctions between economies of scope and scale in higher education is provided by Morris (2008).

'Complementary' tasks are those that jointly contribute to producing the product. They need not be similar; a growing example from higher education is the separation between content (subject) design and development and design of the way it is delivered (instructional design). 'Knowledge maturity' occurs where tasks are complementary but dissimilar and is the environment where modularization has clear advantages. Put another way, knowledge maturity occurs where the knowledge required for application and use can be separated from the knowledge required for development and production. Integrating knowledge mature modules and processes into course design and delivery makes it possible for course teams to exploit specialized competences and knowledge of others without having to master the underlying knowledge base themselves. These knowledge bases can come from other discipline areas, for example from instructional designers and learning technologists, information management professionals such as librarians and providers of e-learning platforms amongst others. By contrast, 'knowledge immaturity' occurs where tasks are complementary and similar. Note the definition of

'similar tasks' as being based on the same substantive knowledge. Clearly organizations can act in a knowledge immature way by attempting to enter into new market areas based on their existing substantive knowledge when, in fact, successful entry into such arenas has black box elements. As (some) universities broaden or focus their missions to embrace new activities or areas of "engagement" new areas of knowledge immaturity may become apparent.

**Modularization in Higher Education**

In terms of the definitions given here modularization is far from new in higher education. Much of the US college system has been built for many years around a unitized structure with a very high degree of module sharing between courses. In the UK sophisticated modular systems were widely adopted by the "new" universities in the late 1980's (when still polytechnics) and early 1990's. The drivers for change included the desire to differentiate themselves from the "traditional" universities (although many of these are also had modular course frameworks), government policy promoting greater access to higher education (HMSO, 1987; 1991) and the push being given by the public accreditation body (Silver, 1990). Resource savings and institutional marketability to students in the form of an attractive and eye-catching overall provision were also frequent justifications for "going modular". In the Netherlands modularization was seen as a route towards creating a more flexible and responsive higher education system (Van Meel, 1993). Typical system designs included were a prescribed core of modules relevant to the broad subject area being studied (for example "economics" or even "social science"), a set of core options which must be taken for an identified award and a range of

opportunities for students to personalize (in a simplistic way) their own programmes of study ("electives").

Whilst the trend towards modularization was embraced by many, there were critics. The major areas of concern were the effects on academic standards, the potential for losing coherence in study programmes, thus devaluing them in the eyes of employers and other higher education institutions, and the impoverishment of the social aspects of the learning experience, particularly in areas where situated learning (although it might not have been labeled as such) were the norm, such as studio-based art and design education. From the tutor perspective "service teaching" was sometimes seen as less desirable and challenging than other work.

Modular course frameworks have also be used to develop new courses quickly. One variant of this is the "platform" strategy. A "platform" is a collection of module systems which provide a common base on which a range of related products can be built. Each individual product is given its own identity by the addition of modules which are specific to it. Platform strategies are a means of achieving high volumes of common substructures together with a wide range of visible variety. Redesigning a platform for every new instance in a product range is extremely expensive and so platform sharing has become common practice in a number of industries, for example auto manufacturing.

Much recent course differentiation has been achieved in this way; the bewildering variety of MBAs provides a case in point. Courses are differentiated by using different specialist

modules, adjusting delivery methods to take account of diverse student groups, and adding appropriate features to improve market segment attractiveness. However there are potential issues with platform strategies. Firstly, through sharing modules and platforms across courses there is a danger that if a module "fails", then the whole range will be affected denting departmental reputations and possibly disillusioning students. Secondly, course identity can suffer if students have difficulty distinguishing between one from another. A further problem lies in platform sharing between courses in that the "brand exclusivity" can become diluted. Students in a named subject area which they see as bearing some kudos may not want to share modules with students on courses seen as having less "value". Thus "executive" MBA students may not want to share modules with full-time MBA courses and business undergraduates may not like other students invading their classes to do a "bit of marketing".

**Modularization and e-learning**

The previous section is couched in very general terms. However the concept of modularization has taken on a new life as e-learning, and particularly blended learning, has taken hold. For example a recent study of blended e-learning in the UK reported that the most frequent rationale for its implementation was "maintaining quality in response to increasing cohort sizes" (Sharpe, Benfield, Roberts & Francis, 2006:3). However this may illustrate some misconceptions about how the gains from e-learning might be realized. In particular it implies that scale (in the form of larger cohorts) is the issue rather than managing increasingly diverse groups of students studying the same courses at different paces, via different means and in varying physical and virtual locations or

mixes of them. As Boys and Stanton (2008) among many others have noted, size achieved through product differentiation and extending delivery into new markets is the issue rather than scale (more and more students doing essentially the same thing). This is not to deny that there are benefits to the application of e-learning which derive from scale effects, particular examples include e-assessment and the use of simulations and games both of which have high costs of development but low delivery costs (JISC, 2008), but focusing on scale alone may lead to other more widespread benefits being undervalued.

The downside of this extension of higher education is market fragmentation. With markets fragmenting, product innovation becomes progressively more important in satisfying discrete market segments. Market fragmentation in turn leads to reduced demand within each segment thus encouraging lower enrolments on some courses as well as the parallel growth of niche products. For example, over the decade 1990 to 1999 the number of higher education qualifications with the word “horse” or “equine” in their title grew from two to over one hundred. Fragmentation is also occurring by time and place. Many, perhaps the majority, may still say that they prefer to be taught face-to-face with other students on a physical campus. But there are many potential and actual students who cannot easily access education in this way and for some online delivery is the only possibility. Even those who are lucky enough to be able to study full-time at a university (in the traditional sense of “at”) may want a sophisticated bundle of added value digital support and information services integrated with the more conventional aspects of face-to-face delivery. Universities can only meet these demands if they adopt much more flexible design and delivery methods than they have done in the past. For universities

with a "business facing" mission this is even more important since response times to design, develop and quality assure new tailored (niche) programmes which are measured in years rather than weeks will be met with incredulity by customers.

Platform models and other variants of modularization are based on re-using existing components or groups of them in different contexts. It seems logical to hypothesize that the potential for re-use may increase inversely with the size of the component but that the benefits of re-use are greater with large components. In educational settings we can think of learning objects as being components. The adoption of learning objects has frequently been seen as one way of resolving the dilemma between the demand for variety at the course level and the realization of economies of scale via the spreading of fixed costs at the component level. (See, for example, Weller, 2004.) Learning objects can be very small (and thus embrace very few functions) or quite large and cover a number of functions. Larger learning objects also feature a substantial amount of internal design and context; this may limit their reuse potential. Overall it might seem that the smaller the chunk the easier it is to re-use it but the lower the pay-off from re-use. However, we could easily argue the opposite way. Market fragmentation drives up the potential need to re-use content where we can but also limits the potential for being able to design re-usable components because customers want something different.

**'Unbundling' Modularization**

Whilst there are undoubtedly potential benefits to be gained from e-learning coupled with modular course architectures there may be limits, some noted above, to the extent to

which they can be realized. Most arguments for the potential benefits of modularization within an e-learning environment rely on versions of the "unbundling" model. The various forms of the argument rely on deconstruction of the education value chain, separating 'substance' from 'process' or distinguishing between content and the services which go with it.

Starting with the most general of these propositions, Boys (2008), following Greenberg (2004), equates the substance of teaching and learning (and research) services with the core business of universities. 'Processes' are identified with administration. The argument then runs that the substance of education should not be subject to the normal narrow objectives of business performance (mainly measured by financial indicators) but the processes can, and should, be. 'Substance' should be judged by reference to professional standards and academic freedom. The problem here is that the argument is far too general to be of much use. Except in the most obvious cases it is almost impossible to separate substance from process. Is module design 'substance' or 'process'? To what extent can we regard different delivery modes as just processes? For example Boys categorizes

*….the continuing – and unnecessary – assumption that university education can only be provided by having thousands of teachers of differing skills across the country in many different places, teaching and assessing self-selected variations on a discipline theme* (Boys, 2008:8)

as an example of process. Whilst this traditional model may lack scalability other than through potentially expensive repetition, it may have other benefits which have a

(market) value. In particular the argument in the quote seems to deny the importance of the context of the student and the personal input of the lecturer and may reduce the idea of personalization of teaching and learning to what the student might be able to engineer for themselves from a highly limited or non-existent set of content variations. Of course university learning and teaching is a subtle and complex set of interrelated activities and the substance/process distinction (if one can realistically be made) is highly dependent on the particular activity being considered. Put another way, the reason why the universal black box module in first level mechanics (or whatever) has not become a feature of undergraduate engineering programmes across the world is not because teaching staff are unreasonably clinging to an antiquated production model in their courses but because the particular cultural, institutional and programme context in which a module is delivered, the teaching style of the personal delivering the module and the expectations and prior experiences of students are critical factors in learning and teaching. This is not a new argument. For example it was put very powerfully by McNay (1994) when he argued that, badly managed, open and distance learning could lead to the adoption of instrumental approaches to learning and external prescription of content could lead to the discovery element of learning activity being squeezed out.

Deconstruction or disaggregation of the (education) value chain is the process whereby the elements in the chain of production are broken down and undertaken by different entities. The process of designing, developing, testing, delivering and assessing a module has usually been delegated to, and undertaken by, a single individual or small team, the module lecturer(s). By unbundling the different activities, it is argued, we can reduce

costs and/or generate higher value at each stage in the chain by getting those best able to undertake the relevant tasks to specialize in them. There is nothing new in this; the Open University in the UK has forty years of successful experience of centrally designing and producing modules which are then delivered by locally-based or online tutors. Of course doing this successfully demands other skills, including the ability to develop and manage mixed membership course teams and inter-professional working. Taken even further, unbundling activities might include elements of outsourcing through, for example, buying in ready made modules or contracting other agencies to undertake the delivery.

Again the critical issue is whether or not quality falls as unbundling occurs. We should not automatically assume the inverse relationship; for whatever reasons the Open University has scored highly in the National Student Satisfaction Survey (NSS). However many students express a preference for face-to-face contact with tutors but may recognize trade-offs between reduced face-to-face contact and other characteristics of courses, for example reduced price, increased convenience or better service. “Quality” is a difficult concept here. A well designed and delivered e-learning module may better than a poorly taught one even if, in the latter case, the module originator is also the face-to-face tutor. However, in most cases, students will either not be presented with a choice or even if they are will not have the information needed to make a rational decision. There is also the possibility of problems arising at the interfaces between the stages of the value chain if the different activities are undertaken by different entities or teams. For example delivery agents (tutors) may have differing views on topics from producers (module authors) which could show up in different understandings of what is required in response

to assessments. Returning to the discussion of knowledge management above, this begs the question of how far the tutor is simply a 'user' of knowledge and can, or is willing to, rely on the author's substantive knowledge.

It may also be the case that e-learning provides the opportunity to change (deconstruct) the way in which learners are supported. One way of approaching this is to refine the idea of a 'business model' by distinguishing between e-operating models (for example, online enrolment), e-business models (for example, the separation of learner support from module delivery per se practiced at the University of Phoenix, see Swenson and Myer, 2005) and e-management models. This general distinction is one used by, for example, Hamel (2007). An example of a new management model is open-source software development. For higher education the parallel move could be towards open-source learning and teaching content development, a far more wide reaching concept than simply making content more freely available in shared repositories.

The third variant of the unbundling argument is the notion of separation between the production of content and the provision of the services which go with it. Perhaps the best known and potentially most successful example is the MIT Open Knowledge Initiative (OKI). On the surface the decision of an elite institution to make all its teaching materials freely available online would seem to make little sense. However there a number of potential business (rather than altruistic) reasons for taking this path. Firstly, the MIT brand could be strengthened as a result of greater exposure in a favourable light. Secondly OKI is now a consortium of several high reputation institutions, each of whom

consumes more course content than they are able to produce. Thirdly, such a move could extend MIT's market footprint by permitting (licensed) content delivery in other locations. Fourthly, MIT's business model and competitive advantage may lie not in the exploitation of content per se but in the education services bundled with that content or, put the other way, MIT is an educational services provider which bundles some content for free. However there is a question as to how far such a model can be generalized given the major reliance of OKI on the brand reputations of the contributing members. Brand reputation is here being used as a surrogate for quality - if the module bears the stamp of MIT, then it must be good.

There are also market dangers to modularization as pointed out in a recent *Times Higher Education* article:

*Another way of achieving flexibility ….. is to share course architecture across a number of disciplines, perhaps developing a new course around a core subject made more contemporary and exciting with supplementary cross-discipline modules. But a danger here is that a new course that shares much of its architecture with another programme risks competing with that programme.* (Swain, 2008:35).

However there is another danger inherent in this approach. Experience in other industries has shown that "stretching" platforms too far can cause problems. For example, in the early days of developments of consumer 4x4 vehicles, platforms on which pick-up trucks were built were used as the basis for bringing new models to market more rapidly than would have been the case if a new platform was developed. However pick-up truck platforms proved, in many cases, to be unsuitable since they were designed for a different

operational context. In some cases this left manufacturers with a poor product and dented reputation in an important market segment.

Perhaps the most interesting scenario of all embraces the recent emphasis on co-creation of products and services. One example of co-creation is the open source software model. An important feature of this is that consumers of the product are also creators of it. The idea that customers can be valuable partners in processes involved in the creation of new products has been explored in depth by Prahalad and Ramaswamy (2004) and in the context of public services by Bradwell and Marr (2008). The benefits of involving students in the creation of modules and courses have long been recognized, although the reality may restrict their influence to participation in quality assurance processes or being consulted when new courses are being developed. A more expansive approach sees course design as a participative and developmental process in which students play a full part in generating content including assessment. Course creation becomes a continual building process across time and space and course delivery (consumption) is not neatly divided up into time-bound chunks governed by particular cohorts of students passing through. Such an approach is made possible and attractive by the emergence of social software. For example, a simple but often effective way of doing this is to use a wiki as the core framework of a course. On the other hand the co-creation model emphasizes the context in which a module or course occurs over pre-determined tutor-produced content. Each and every instance of what is, on the surface, the same module is different because its creation has been the product of a unique set of social interactions.

**Summary**

Higher education institutions are increasingly competing for students in a competitive market. Whilst reputation and academic standing are still probably the most important dimensions of institutional competitive advantage, particularly in markets where fees are regulated, product differentiation at the course level has become an increasingly important element of competition. This puts pressure on institutions to develop potentially attractive new courses quickly whilst preserving their reputations for overall quality; shoddy new courses must not be allowed to reflect poorly on established ones. Modularization has, and does, provide a potential means of reconciling these needs by re-using established modules in new combinations and contexts to provide a platform on which new courses can be built.

Modular strategies have long been used in other industries as a means of resolving the market conflict between providing products at prices the majority of customers are willing to pay and the ever-increasing demand for differentiation. This article argues that higher education can learn from these experiences, even recognizing that higher education is very different from, say, manufacturing industry. Such comparisons are dangerous and to be avoided if we slavishly advocate transferring ideas from one setting to another. However they are also valuable if they point out why crude copying of this sort is fraught with danger. Higher education courses are different from many products and some services in that it is often not possible or desirable to separate the content of modules from the context in which they are used. This imposes potential limits, which

need to be understood, on the extent to which modularization can be deployed as an effective basis for course design, development and delivery strategies.

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