

Learning While Earning: The Key Role of Supported Distance Learning in Delivering Innovative, Industry Focused Courses to Up-Skill and Develop Employees in the Motor Sports Sector

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ABSTRACT

This paper highlights a distinctive, highly-innovative, and project-based approach to supplying cutting-edge, market-driven and industry-focused education courses, at post-graduate level, in key motorsports engineering, business, and management subjects, using a highly-flexible, supported distance learning format. Such courses aim to deliver high-quality, usable knowledge to engineers, managers, and even drivers, with minimum disruption to their normal work patterns.

OVERVIEW

Companies often bemoan that academic offerings lack market and industry relevance. In response, those in academia feel that industry often fails to communicate its real needs for education and training. This paper highlights a highly-collaborative team approach to the design and delivery of courses involving members experienced in industry, motorsports, and academia, including distance learning teaching. Course developers use contacts with key personnel in the industry for guidance, case studies, and data for application in the study materials, and, crucially, present them in a form suited to study distant from the conventional class room environment.

The paper summarizes the approach, structure and topics covered in modules related to data acquisition systems, racing car chassis dynamics, and business for motorsports. Included are examples of learning outcomes and assessment activities. Courses so far piloted give clear indications of enthusiasm for and engagement with this mode of study in parallel with working in the motorsports sector.

Study materials include specially written texts, references, DVDs of filmed case studies, online exercises, project assignments *etc.* All are designed as an integrated package of study for users working individually on a part time basis, for example at home, in the work place or perhaps an airport lounge, at their own pace, and times to suit their convenience.

The course team believes that the supported distance learning method of study adopted is ideally suited to the busy world of motorsports, at all levels. It provides key personnel with the opportunity to consolidate and update their knowledge, in order to improve competitive advantage, but without losing ongoing work contributions and commitments.

METHODOLOGY OF THE PAPER

The Objectives of this paper are to:

- Consider some of the problems and inhibitors to industry engagement with conventional motorsports educational programs;
- Outline a distance learning approach to supplying education modules in various topics of Engineering, Business, and Management which are relevant to the motorsports industry sector;
- Demonstrate why this approach has been highly successful;
- Detail the long-term benefits.

INTRODUCTION

Numerous industrial sectors have long protested that many contemporary academic offerings, ostensibly intended towards improving their businesses' competitiveness, lack accessibility, market focus, real-world applicability, and – thus – contemporary industry relevance. A perennial complaint is that newly-graduated students are not equipped with the skills '*to hit the ground running*'. At post-graduate level, criticisms continue: for example, courses are not accessible by work-based learners for Continuous Professional Development, personal growth, and employee upskilling purposes. The faster moving the industry – and motorsports obviously is a key example in this respect – the more the criticism appears to be leveled. Academia ripostes that often industry fails in communicating its real needs in education and training. Although both arguments possess merit, the authors feel that industry indeed has a point.

BACKGROUND TO THE NEED TO DEVELOP THE PROGRAM

With respect to the UK motorsports industry, the real concern about the industry-specific relevance of university-inculcated engineering skills, detailed previously, exercised key policy advisors to the UK Government over 12 years ago.

In 1996, a European Economic Commission¹-funded economic study was undertaken. This followed the closure of a major UK-based US airbase (at Upper Heyford, in North Oxfordshire), with consequent high loss of jobs in the area, particularly in engineering, and subsequent (possible) far-reaching economic impact to the region. To (hopefully) mitigate further detriment to the region's ability to provide employment, prosperity and well-being, and ability to contribute overall to UK-plc, and its industrial competitiveness, this study focused

primarily on establishing what comprised the underlying industrial strengths of the area at that time.

'Motorsports' in the UK subsequently was discovered by the study to be one of a small number of world-class industrial sectors (akin to Silicon Valley, in a number of key respects), upon which the region (and the UK²) was highly-dependent for its prosperity, and reputation for innovation and engineering competitiveness, on a global scale. This was a surprise to a number of interested and concerned parties at that time). These findings resulted in the creation of the Oxfordshire Motorsports Forum (OMF).

The OMF forum was formed with the fundamental objective of understanding – then addressing – the local skills, education, and training needs of this key industry, in order to support employment, sustain wealth generation, and grow ability to compete internationally in this key (and cross-discipline and cross-industrial sector) engineering field. [1]

Following a number of key consultations, the Forum identified that the regional (UK)³ motorsports industry at that time was seriously threatened by a fundamental skills shortage (specifically, in ascending order of the engineering recruitment 'food chain': insufficient numbers of schoolchildren attracted into 'STEM' – Science, Technology, Engineering and Mathematics – subjects; lack of technicians skilled in crafts and disciplines appropriate to the motorsports industry; and inappropriately-skilled graduate engineers), and as a consequence of these findings, a taskforce was established.

This taskforce comprised a pioneering (at that time) partnership/collaboration between the various interested stakeholders, including regional Government⁴ (who sponsored the enterprise), the local council, a good representation of the regional motorsports industry (including Benetton-F1⁵, Prodrive, TWR-Arrows and Reynard Motorsports), innovation organizations, and local academia at a number of levels (university, further education college, and school). [2] The taskforce's overarching aim was to address the problem inherent in the fact that, in the mid-1990s, as motorsports

² The UK motorsports industry currently contributes over 1% of GDP, turning over £4bn and exporting 40% of this

³ 70% of the UK's motorsports industry resides in the South East of England, with five of the current nine F1 teams (seven of 11, until recently) being based within a 50-mile radius of Oxford. The region is also home to companies such as Prodrive, Xtrac, MIRA, Ilmor and Menard

⁴ HoETEC – Heart of England Technology and Enterprise Council

⁵ Now RenaultF1

¹ Now the European Union (EU)

technology progressed at ever more rapid rates, and began to embrace esoteric, new, highly-complex scientific and engineering areas, such as material science in the area of composites, the increasing use of CFD, increasing sophistication of data acquisition *etc.*, the majority of graduates, even the very highest-grade students from highly-respected institutions, were taking anything up to three years to become useful to a motorsports company.

Consequently, inter-firm poaching of key staff was rife, salaries were escalating to an unacceptable level, and the situation was rapidly becoming unsustainable. As noted earlier, the situation was exacerbated by the fact that there was also a serious decline in the number of entrants taking mathematics and science subjects at school: the corollary to this was that there was also a decline in those entering engineering degree programs. Something had to be done if the situation wasn't to become terminal and the UK motorsports industry slid into gradual decline, as its motorcycle and other transport-related industries had done so in the past...

The taskforce, which – critically – was both a 'Think-tank' and importantly, a 'Do-tank', instigated real actions: to develop graduate engineers for the motorsports industry in collaboration with the regional university, through the creation of a world-first BEng degree in Motorsports Engineering (with curriculum steered by industry, and which included motorsports company-sponsored industrial placement schemes); the establishment of a program to develop technicians with a range of skills by providing a bespoke motorsports modern apprenticeship at a local community college, and the development of the Formula Schools program, an exciting, national schools competition where high-school students would design, develop, build then race scale models of racing cars [3]. Formula Schools, at its particular target educational level (13-16 year-olds), was akin in many respects and aspirations to SAE's own successful AWIM (A World in Motion) and Formula SAE programs. These engineering-themed initiatives (often employing motorsports) are used first to inform young people about STEM educational programs, then to enthuse and attract them onto these programs (at a variety of levels from school to University), and subsequently, it is hoped, into STEM careers.

The enduring long-term, high strategic value of participation in – and strength of the community spirit of – the OMF is seen, some 12 years later, in that the original participants in the forum – Government (regional and central), industry, University, further education college, and school – still regularly communicate and collaborate on motorsports-related initiatives. Indeed, all still mutually support and market each other when the need arises and the opportunity presents. Perhaps, from a more telling and objective critical perspective, the

significance of the forum as an agent for beneficial impact to cluster competitiveness is seen in the way that as a model for successful strategic collaboration for mutual high benefit, it has been identified numerously as an exemplar of best practice. For example – *'Oxfordshire were the pioneers in providing relevant support (particularly the training and development of craft and graduate skills) through the excellent Oxfordshire Motorsports Taskforce'*. [4] This is to the extent that its formation and subsequent collective successful actions are recognized as being one of the key changes 'institutionally' which occurred in support of the UK motorsports industry in the mid-1990s, after a long period of demeanor by it (since dominance from the fifties onwards), which Henry and Pinch [4] characterize as *'...an agnostic – if not downright antagonistic – view towards "institutions" (and especially, the State)'* up until that time.

It is often said that imitation is the sincerest form of flattery. Others beyond the immediate interested regional UK stakeholding group, (and impartial evaluators and commentators, academic and otherwise) have recognized the high strategic value and long-term potential of the collaboration of the OMF's constituency. Evidence to show this is where the forum or taskforce has been replicated subsequently (in partial substance, at least). These have been convened in a number of regions and countries having competitive motorsports industries, especially where industry- and Government-based power bases wish to sustain and develop the cluster or sector [5, 6]. The OMF is referenced numerously – for example [7, 8] – as particularly demonstrating an initiative (and subsequent follow-on process) which has had the powerful ability to impact on high-technology cluster development and sustainability. This aids in facilitating the fruitful engagement of companies with the regional academic knowledge base and other interested stakeholders.

However, the UK motorsports industry was not without its problems. Despite a steadily-increasing influx of industry-ready graduates to the regional motorsports industry as a direct consequence of the programs initiated by the endeavors of the OMF, the high-profile demise in 2002 of local companies Reynard Motorsports and TWR-Arrows raised concerns and prompted questions in central Government about the UK's continuing ability to sustain its global supremacy. This was in view of increasing, aggressive international competition, and the surprising failure of what had been until their demise high-performing and globally-successful UK motorsports companies. The services of Prof. Michael Porter – a Harvard academic noted for his theories on cluster development – were invoked. He noted in his subsequent report [9] that:

'Due to the diverse nature of a [motorsports] cluster, there are often many conflicting agendas for development. It is essential that members of the cluster recognise this and work together to generate a single vision and action plan that benefits the whole cluster. The ultimate goal of an initiative should be to create consensus among the key stakeholders in the cluster on a set of actions most likely to enhance the future of the whole cluster. This can only be achieved if the key decision makers and interested parties can be brought together in one forum and if those decision makers are furnished with the best possible information about the competitiveness and the context of the cluster; only then will they be able to make the trade-offs required to develop an integrated action plan'.

Thus, in fall 2002, the UK Government convened a panel comprising motorsports industry-acquainted individuals representative of various key elements of the UK motorsports environment at that time, including: the sport; industry; regional and national Government across various departments; academia; trade associations; learned bodies; and other stakeholding groups (the DTI Motorsports Competitiveness Panel) [10]. In certain respects, the panel's overall constitution comprised a larger, less regional, more representative, but more discipline-specific⁶ evolution of the OMF of eight years previous. It also had the high-level backing (and subsequent funding of recommended projects/initiatives derived as a result of its findings) of several high-profile central Government departments (the Dept. for Trade and Industry, the Dept. for Education and Skills, and the Dept. for Culture, Media and Sports).

The remit of the Panel (and its four Working Groups) was to consider what it was that made the UK motorsports industry globally-competitive (and what might threaten this competitiveness), to then conceive of measures, policies, and initiatives which Government should introduce and fund in order to mitigate any overseas threat.

In their final Report, this group concluded (perhaps not surprisingly) that skills, education, and training were absolutely fundamental to the UK's global competitiveness in motorsports. Importantly, the work of the *Technology and Innovation Working Group* of the Panel noted, *'the development of a 'post-graduation' motorsports[s] academy' is perceived as a better way of proceeding rather than specialist long-term courses on motorsports[s], which tend to duplicate parts of existing courses... [and so] the group recommends that a series of supplementary post-graduate courses be funded to accommodate the needs of individuals wanting to*

become involved in motorsports'. This sentiment was echoed in the report of the Skills, Education and Training Working Group of the Panel, which determined that *'surveys [11] found a need for... short, effective courses delivered flexibly'.* Such a statement was particularly significant given the demographics of the UK motorsports industry: 90% of its 4000 or so companies are characterized by being in UK parlance what are termed 'SMEs' – Small-to-Medium-sized Enterprises – i.e. companies turning over less than US\$66m and having less than 250 employees (although the majority in the sector are deemed to be 'micro', and have less than 10 employees).

Finally, work undertaken to create the Workforce Development Plan, (a research project undertaken concurrent to the Motorsports Competitiveness Panel initiative, which was commissioned by a number of regional Government agencies having a vested interest in the UK's motorsports cluster, and which fed beneficially into the Panel process), arrived at the following key conclusions with respect to educational provision:

'Motorsports course content must be Industry led. Industry should be prepared to be pro-active, to collaborate with Educationalists in identifying needs, and to become closely involved in the design and delivery of courses. Both need to understand and appreciate the invariably-rapid changes in skills requirement, [which are] more often than not difficult to anticipate and to reconcile with curriculum lead times. Consequently, emphasis needs to be firmly focused on the delivery of sound foundation content in the first instance, with the specialism flexibility necessary to recognize "skills churn", an outcome which is more likely to come from the work-based learning environment'. [11]

There appeared to be three fundamental obstacles to surmount if the recommendations of the Competitiveness Panel (and the findings of the Workforce Development Plan), in respect of post-graduate level motorsports educational provision, were to be followed closely and successfully:

- Radically improve industry applicability and market relevance of post-graduate level course provision, by engaging industry more in course evolution;
- Consider the length of existing courses, coupled to a change in the flexibility of course start and end dates;
- Evolve a course delivery mechanism which addressed the core needs of the busy, time-pressured, work-based learner.

(These aspects for consideration/addressing are of course relevant to all motorsports skills, education, and training provision, regardless of level).

⁶ Beneath the Panel proper sat four Working Groups: 'Finance'; 'The Sport'; 'Technology and Innovation'; and 'Skills, Education and Training'

And so it was that the seeds for the formation of the 'Learning while Earning' – Motorsports CPD (Continuous Professional Development) – project were sown...

Funding to begin development of the courses originated from a University-internal enterprise investment competition. The available funding tranche was intended to support innovative, market-focused (but generally, inherently-risky) projects anticipated to bring academia and business and the community closer together (and generate revenues and surplus to sustain the project indefinitely). The UK's Higher Education Innovation Fund – HEIF – (which also funds the 5-year, US\$2.0m Motorsports Knowledge Exchange project) provided over US\$400,000 to establish the courses, and so the project was born.

Funding provides for a dedicated, close-knit, multi-disciplinary course team comprising members (including external consultants employed as expedient on an *ad-hoc* basis) highly-experienced in motorsports, engineering, business, distance learning, and other complementary areas. Such a team thus is able to capitalize on contacts with key personnel in the industry, initially for guidance on course topics to be developed, then for strategic steer and critical review of material during the development process, and provision – crucially – of contemporary case studies and design data, particularly for use within analysis examples and assessment exercises.

Education materials produced for motorsports distance learning in this manner includes complementary written texts, reference texts and articles, DVDs containing professionally-filmed case studies and discussions with in-house technical experts, on-line exercises and assessments, interactive examples, final project assignments *etc.* All are designed to form an integrated study package for students working individually on a part-time basis, at home, in the work place, or anywhere else, at a pace and at times to suit their convenience. As is well-recognized, time is of the essence in motorsports, and we're not simply talking about saving time on the circuit, but also time to the next event, and tellingly, time for staff to be released for study/personal development purposes.

Self-contained and flexible timescales for start and delivery of distance learning modules (the courses operate 24/7, using what is called, in the learning vernacular, a 'roll-on-roll-off' delivery model) allow companies, staff, and independent learners to select times for study to suit their deadlines, without heed to the seemingly-arbitrary semester and examination schedules inherent with traditional teaching regimes. This *modus operandi* also allows courses to be delivered anywhere in the world.

The paper also indicates specific examples of the approaches taken in teaching key aspects of the subject areas.

GENERAL APPROACH TO DISTANCE TEACHING

A key factor to understand when developing distance learning materials is that *distance learning students are a disparate bunch*. Thus, it is unwise to assume or expect that they have a common background of education, experience, or understanding of the subject(s) which they wish to study. Although provided with advice and recommendation that nominated 'pre-requisite' level courses in relevant subjects should have been completed, there is no guarantee with students that this will be the case, and even if so, there is even less guarantee that the required knowledge and understanding has been embedded, even with the best student. (It is important to note that this factor alone provides a profound difficulty for universities used to employing more traditional mechanisms to shortlist and enroll candidates for post-graduate-level courses). Inevitably, therefore, there must be some form of summary remedial teaching provided at the commencement of courses, if only to identify and then clarify common areas of misunderstanding, and agree on use of terms and units. However, as well as being self-correcting, this material will be of benefit to *all* students: this is to the extent that students familiar with the material will have little difficulty in progressing through it, without being held back by the slower student who will need and take as much time as necessary.

In practice, it proves eminently useful if course team members can exploit rich industry and motorsports experience, and a holistic understanding of the sport and the industry in the context of a wider interested stakeholding group, in addition to possessing the requisite academic knowledge and teaching skills. As an example, there is no substitute for the experience of leading a team of highly-motivated students in the design, preparation, and running of a competitive car in the Formula SAE and Formula Student series. Other team members have personal experience of motorsports participation to international level as mechanic, driver, team owner and manager, and with leading a team designing and building a high performance road car. The remainder brings a variety of other highly-complementary skills, including project management of multi-million pound projects, and research, authoring, illustrating, learning technology, and complex documentation abilities.