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Abstract
The further and higher educational college (HEC) markets within the United Kingdom are considered to be dwindling. This has made it extremely difficult for private colleges to attract students as well as to provide a medium for alternate education within Britain. We present our research findings having conducted an extensive case study of a private college providing higher educational services within greater London. The research also provides a platform for determining the merits of using artificial neural networks within this sub area of education provision. In order to demonstrate a case for the integration of neural systems in this type of market we explicitly consider the snap-drift algorithm for determining likely benefits for creating intelligent markets in private colleges of higher education.

Keywords: Intelligent Markets, Private Higher Education, Neural Networks

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ABSTRACT

The further and higher educational college (HEC) markets within the United Kingdom are considered to be dwindling. This has made it extremely difficult for private colleges to attract students as well as to provide a medium for alternate education within Britain. We present our research findings having conducted an extensive case study of a private college providing higher educational services within greater London. The research also provides a platform for determining the merits of using artificial neural networks within this sub area of education provision. In order to demonstrate a case for the integration of neural systems in this type of market we explicitly consider the snap-drift algorithm for determining likely benefits for creating intelligent markets in private colleges of higher education.

1 INTRODUCTION

Education considered the cornerstone of society has been dwindling within the United Kingdom for the last five years. The exact reasons are unclear; however, it has been argued in the past that fewer students are now willing to embark on academic pursuit in Britain due to the respective constraints such as immigration and a lack of readily available job prospects during the years of study. This has been made more evident, as more post 1992 universities are devoted towards creating academic agreements with established colleges. Most evident are Holborn and St.Patricks colleges. Also, it has been made apparent that more overseas students (i.e. those not directly associated with the European Union) are more inclined to enrol with a private college because fees are somewhat cheaper as opposed to direct university enrolment.

2 HEC CHALLENGES

As the student numbers continue to dwindle, there is a designated need for deploying technology. Therefore HEC's must be able to attract students and identify there specific needs in regards to training. This we believe is difficult as now such institutions must also amass the ability to maintain student levels for ensuring that students remain at their respective institutions for pursuing accredited university courses. For these institutions to survive they must be operated as any other business. Hence, for our research purposes we denoted our case under examination as a small firm. Chiefly because we have found that our case study as well as the competition falls into the European Union classification of small and medium enterprises (SMEs). All of which, indicates that the case in question would also need to satisfy their respective customers (in this case students) whilst operating with a limited employee infrastructure.

3 CREATING INTELLIGENT MARKETS

Small firms have essentially adopted two levels of marketing that there larger counter-parts have proven to be useful in there respective functional areas. These two levels of marketing are strategic and operational types of marketing.

3.1 Strategic Marketing and HEC's

For HEC's to initiate marketing they must be concerned with the strategic type of marketing. Therefore being better able to assess how one firm competes against another firm in a predefined market place. Strategic marketing in HEC's would have to be undertaken in order to ensure that a firm is fully equipped to capitalise on potential threats associated with existing firms, operating in the same market or firms in alternate markets that possess the capability to become a competitor at a later date.

Each of the four stages of strategic marketing should be followed explicitly. These four stages are planning; information gathering; decision-making and implementation. At the planning stage the firm is more concerned with the determination of clear set of goals (or objectives) and a feasible mission statement. Hence, management must be able to demonstrate where they are expected to be in a fixed number of years in the future.

Information gathering must focus on the firm's external environment. As a result, management should focus on ensuring that an organisation is open in ensuring that they are responsive to the needs of their customers. This may include the family and friends of employees working in that firm, as this is the only way to determine how market changes will affect a firm. Essentially, communicating with the outside world will determine when and what changes are required for ensuring that the right products and services are being provided.

The type of information gathered will determine what type of decisions is to be made and as such this will establish the type of marketing strategy to deploy. For example, if the external environment suggests that customers require more child friendly products, then this may lead to a new product being created that attempts to capture a child focused market. If all decisions have been made then a strategy has been created. For such a strategy to prove beneficial to any firm it has to be executed at the right time. Therefore, the implementation time will determine the success of that marketing strategy.

3.2 Operational Marketing

This type of marketing consists of the 4 Ps associated in marketing normally referred to as the marketing mix. They are product, price, place and promotion [1]. Product refers to the item that is being marketed whereas price is the numerical value associated with the product being sold to a customer. Place refers to the location where a product is being sold whilst promotion is purely dependent on how the marketer attempts to communicate the existence of a product. Promotion normally takes the form of an advertisement via radio, television, print advertising or Internet advertisements.

4 SMEs AND MARKET SEGMENTATION

A market segment occurs when an existing market is divided into subsets. These subsets behave similarly to each other, making segments in similar categories more likely to respond to similar marketing models [2]. Each market could be categorised as either top-up or bottom-up approach. Top-up occurs when a marketer divides the entire population in a certain locale into segments. Bottom-up is more concerned with a single customer. Thus, a profile is created based on what products and or services that a single customer is interested in.

5 THE UNSUPERVISED SNAP-DRIFT NEURAL NETWORK (USDNN)

This type of network is closely based on both adaptive resonance theory and learning vector quantisation. It was created as a potential solution for the limitations found in using adaptive resonance theory especially in non-stationary environments [3]. It has the advantage of interpreting data under analysis irrespective of the type of network performance that the network is currently associated with [4]. Therefore, it can toggle between both types of performance giving either a snap effect when network performance is poor or a drift effect when network performance is good [5]. For a more in depth explanation of Figure one below see [3-5].

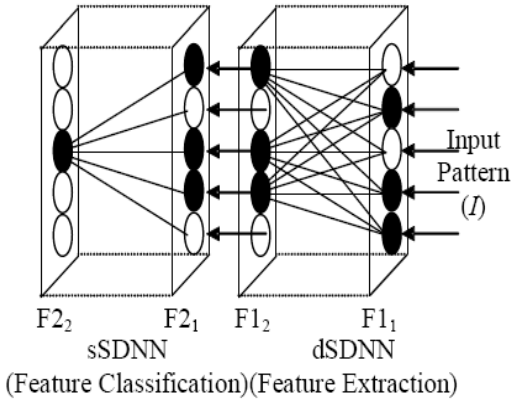

Figure 1: USDNN architecture.

6 METHODOLOGY

In order to determine the likelihood of our chosen case being successful in its predefined market a short proforma consisting of eight categories was used for collecting student characteristics. Each of the eight categories is course type; course name, course length, country of origin, cost of course, start year, gender and age.

Our chosen HEC provided us with a sample size of 216 from a total of 453 enrolled students (approximately 48%)

6.1 Data Pre-processing

Each variable was either data scaled or data normalised in order to ensure that the likelihood of key similarities between variables could be optimised. We found that all variables were needed for data analysis to be effectively meaningful.

6.2 Results

The snap-drift neural network was fed with student response inputs. All of which were used as independent variables for this network. This lead to seven distinctive classes being form within the data collected. Our classes were created as a result of using an unsupervised snap-drift neural network. This meant that our dataset did not have to be split into training, testing and validation types of data. However, optimal network performance was achieved by determining the point at which our network no longer needed to perform self-learning. In this case we achieved this at five hundred epochs. At this stage we could see that our data classification did not change beyond this point.

6.3 Brief Explanation of classes

Seven classes have been formed within our data under examination. Each member of each class is regarded has having similar characteristics to that of its member. Therefore, members of one class cannot belong to another class.

Class one currently consists of only students deemed as international students for fee purposes studying professional courses such as the British Computer Society (BCS) professional diploma and the Institute for Management of Information Systems (IMIS) Higher Diploma. Each member of this group are undertaking one year course primarily of African and Caribbean origin.

Class two hosts members pursuing hybrid courses (i.e a combination of business and computing modules) at the degree and professional course level such as the Association for Business Executives (ABE) courses.

Class three consists of students mostly of Caribbean and South American origins. The majority of its members are female and specifically paying lesser fees as opposed to class one that consisted of mostly male students but also undertaking yearly courses.

Classes four consists of postgraduate business students of African and Asian origins. In this classes the category of fee payment is extremely higher than most of the other groups. Fees are attributed to the type of degree as opposed to country of origin.

Class five consists of students participating on English for speakers of other languages (ESOL). This group had members mostly from Eastern Europe and Asia.

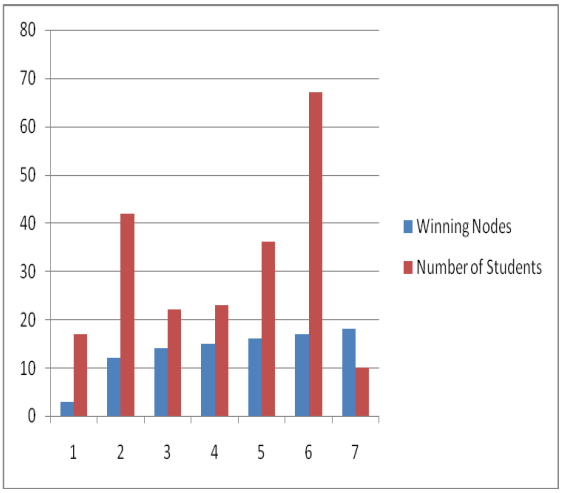

Figure 2: indicates the nodes to number of students ratio

The largest distribution of students currently occupy **class six** (denoted as winning node six in fig.2 above) . Class six consists of sixty seven members of which sixty two (62%) of its members are currently pursuing computing courses equivalent to the UK's higher national diploma standard (i.e second year degree level). This class also indicates that more than ninety percent (90%) of its members are nationals of the continent of Africa.

Our smallest class, dentoed as **class seven** in fig.2 only hosts ten members. All male, possessing an average age of twenty six. Each member of this group are currently pursuing a business type of degree course. It essentially consists of final year (3^{rd} students) making up sixty percent (60%) of this group undergraduate degree and postgraduate degree course students accounting for forty percent (40%).

7 CONCLUSIONS

Our research though preliminary indicates that small colleges can compete efficiently if provided with the intelligent tools for ensuring market sustenance. At this early stage we were able to determine the largest international student percentiles which seem to indicate a market trend across all HEC's within the United Kingdom. Understanding the factors associated with those students opting for these HEC's will determine the right kind of partnerships that should exist for universities generally.

The HEC under examination provides clues for determining how to market academic products to international students. In particular, when using the snap-drift, we have found that students from the continent of Africa provide the largest proportion of students wanting to pursue academic study in Britain. However, most of these students are drawn to a HEC specifically because of the cheaper fees on offer irrespective of course type. Therefore, by determining the amount of such students successfully completing HEC courses it would better aid universities in attracting such students to continue on degree validated courses at these institutions.

Using the snap-drift algorithm we believe that a case for creating an intelligent marketing model does exist. As for HEC's to withstand competition they must now be able to not only attract students but be able to change as existing markets change. A model of this type would proven instrumental in determining types of courses most suitable for current or emerging student markets.

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