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CHANGING GLOBAL SCENARIO OF RESEARCH ON DISTANCE EDUCATION : A BIBLIOMETRIC ANALYSIS

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ABSTRACT

Analysis of research trends on distance education (DE) covering 10 subject areas; Concepts and theories; Areas of applications; Levels of applications; Special learner groups; Methods of teaching; Psychology of learning; Support services; Course development; Choice of medium and Economics of management. The contribution of papers on these areas was on an upward trend at varying rate of growth. The highest publication rate is found on the medium of delivering the programmes (52 papers per annum). It is estimated that this field would grow to a total of 656 papers per annum in the year 2005. Profile of regions indicate that the European countries accounted for 40% of total research productivity on DE, followed by North and South America (23%), Asia (18%), Oceania (16%) and Africa (3%). It is estimated that the publication of Europe would be 941 by the year 2005, followed by Asia (937), America (580), Oceania (501) and Africa (90). The pattern of research publication is found to be uniform with each region concentrating on definite areas of research.

Keywords: Distance education; Distance learning; Publication productivity; Research productivity; Bibliometrics

INTRODUCTION

Assessment and appraisal of research priorities is of fundamental concern to the policy makers. The growing importance of the distance mode of education could be witnessed by the quantum of research publications on the various dimensions of this subject. A quantitative analysis of these research publications would exhibit not only the range of research problems being addressed by the individual regions, but also the social relevance of these problems within the local and global context. Moreover, a critical review of the research efforts of the past years on distance education would assist the policy makers and the administrators both in assessing the status of research activities and in formulating strategic planning and decision making for future activities. In this context, the funding institutions and the research and development centres of the distance learning programmes need answers to such questions as: what are the priorities of the different fields and subfields of distance education (DE)? What is the status of research on these fields at the international level? How have the priorities changed over time? What are the

areas receiving low priorities in a particular region that have gained high priority elsewhere and vice versa?

The present study attempts: (i) to analyse the research efforts of the various regions on the different fields of distance learning; (ii) to identify the similarities of the research profiles of the sample regions; (iii) to measure the trend of research on the various facets of DE over the years; (iv) to assess the pattern of research performance of the regions and to compute the shifts in the priorities during different periods of time and; (v) to rank the regions on the basis of their research performance on DE.

METHODOLOGY

The data for the present study has been collected for 25 years from 1970-95 by downloading the records related to the various dimensions of DE for the five continents, from the database of the International Centre for Distance Learning, Open University, United Kingdom. The entire research output has been classified into ten homogeneous subject groups such as: (i) Concept and theories (G1), (ii) Areas of applications (G2), (iii) Levels of applications (G3), (iv) Special learner groups (G4), (v) Methods of teaching (G5), (vi) Psychology of learning (G6), (vii) Support services (G7), (viii) Course development (G8), (ix) Choice of medium (G9), and (x) Economics of management (G10). In order to identify the equity in the distribution of research efforts of the various regions on the subfields of DE the **Wroclaw's taxanomic model** is applied. It also helps to generate the research performance index for the sample regions/subfields. The measure of performance under this method is always non-negative and it lies between 0 and 1. The closer the measure of performance to 0, the higher is the level of research performance of the regions/ subfields.

C.V. analysis and Dunnett's test is also applied to measure the degree of variations in the subfield concentration by the different regions. The test statistic for geographical variations (D_c)in the research publications is as under :

$$Dc = (\overline{X}_c - \overline{X}_o) / (S_e(d))$$

Where X_c = Mean values between the regions

X_o = Group mean values

$$S_c(d) = \sqrt{2 \times S_c^2 / m}$$ (for m = 5 regions / continents)

(with c = 1,2,3 . . . m)

$$S_c^2 = S_0^2 + S_1^2 + S_2^2 + \ldots S_n^2 / (m-1)(n-1)$$

(with S_0^2 = sum of squares of deviations for entire group)

(with S_c^2 (c = 1,2,3 . . . m) is the sum of squares of deviations for continent 'c'.

The variations among subfields (D_f) is based on the test statistics :

$$D_f = (\overline{X}_f - \overline{X}_0) / S_f(\bar{d})$$

(with f = 1,2,3 . . . n; for n=10 subfields)

$$S_f(\bar{d}) = \sqrt{2 \times S_f^2 / n}$$

The computed D_c and D_f values are compared with the critical values of (D) found from the tabulated value. If an observed value is larger than the tabulated value, it is concluded that the corresponding difference between X_c / X_j and X_o is significant.

The rate of growth of the research publications in the sample regions and among the subfields is calculated by adopting the **polynomial equation model.** The following equation is applied here, to compute the "m" th degree regression function of y on x.

$\phi_t (x) = \alpha_0 + \alpha_1 \phi_1 t (x) + \alpha_2 \phi_2 t (x) + \ldots . + \alpha_m \phi_m t (x)$

where, $\phi_t (x)$ are mutually - orthogonal polynomials. A set of polynomials is said to be orthogonal polynomials, if

$\sum_t \phi_i (t) \phi_j (t) = 0$

For all i, j ≠ J. Here, the time 't' is taken as the independent variable and the number of research publications on the various subfields/themes are taken as the dependent variable. The method of fitting of orthogonal polynomials provides a test procedure that is used to examine the appropriateness of the degree of the curve fitted to the data. Using this polynomial regression to the fitted data, the expected values of 'Y' (research publications) for various subfields/themes can be determined. The values of $\phi_f (t)$ have been obtained by using the "Biometrica" tables corresponding to the number of observations. The least square estimates of the parameters would be:

$$\hat{a}_0 = \left(\frac{1}{N}\right) \Sigma_t Y_{ti} \quad \hat{a}_j = \frac{\Sigma_t y_t f_j (t)}{\Sigma t (f_j (t))2} \quad (j = 1,2,3 \ldots m)$$

The priority indices of different regions has been calculated by adopting the following equation :

$(PI)_{ij} = ((n_{ij} / n_{io}) / (n_{oj} / n_{oo})) * 100$

Where, n_{ij} is the number of publications by country i in subfield j, n_{io} is the number of publications by country i in all subfields, n_{oj} is the number of publications by all countries in subfield j, n_{00} is the total number of publications by all countries in all subfields. Here, 'all' refers to the countries taken for study. The value of PI = 100 indicates that the research priority of a country for a given subfield corresponds precisely to the average of all countries. PI > 100 reflects higher-than-average-priority, and PI < 100 reflects lower-than-average priority. By virtue of the definition of PI no country can have high priority in all subfields. In order to identify the research profiles of the countries a seven point scale is also applied on the PI values.

ANALYSIS AND INTERPRETATION

1. Geographical Distribution of Research Publications on DE

Table 1 presents the publication on DE at the international level and highlights the areas that have attracted a wider attention. It is noted that the publications from the European countries is found to be high at 3107 papers (40.74%), and the publications from Africa is the least at 279 papers (3.7%). The highest research performance of Europe may be attributed to several factors such as having a large number of reputed open learning centres like the one in United Kingdom, expansion of the European Economic Associations and their activities in promoting the cause of DE and also in encouraging research projects and publications. Besides, the well established information infrastructure in the European countries have offered the base for developing research on DE. The least performance of the African countries may

Table - 1: Geographical Distribution of Research Publications on DE

Region	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**Total**	**X_C**	**S.D.**	**C.V.**	**D_C**
Africa	119	12	15	5	29	11	8	28	27	25	279	28	33	117.86	3.89
North & South America	356	28	85	39	139	128	70	160	529	185	1719	172	157	91.3	0.61
Asia	339	27	50	23	138	53	86	122	156	188	1182	118	96	81.36	1.08
Europe	699	57	221	62	324	224	256	303	666	295	3107	311	216	69.45	4.96
Oceania	304	21	50	45	132	88	99	219	286	97	1341	134	101	75.37	0.58
Total	**1817**	**145**	**421**	**174**	**762**	**504**	**519**	**832**	**1664**	**790**	**7628**	**763**	**538**	**70.51**	**5.03**
X_F	364	29	84	35	152	101	104	166	333	158	152.6				
S.D.	210	17	80	22	107	81	92	103	263	102	103				
C.V.	57.7	58.6	95.24	65.86	70.39	80.2	88.46	62.05	78.98	64.56	67.5				
D_F	6.75	3.9	2.19	3.78	0.02	0.17	1.57	0.43	5.76	0.173	3.55				

G1 Concept and theories G2 Areas of application G3 Levels of applications
G4 Special learner groups G5 Methods of teaching G6 Psychology of learning
G7 Support services G8 Course development G9 Choice of medium
G10 Economics of management

be due to the limited number of institutions committed for open learning programmes and the lack of support for research. Next to Europe, a large amount of research is seen in North and South America and their contribution amounts to 1719 papers (22.5%). The Oceanic and the Asian countries have witnessed respectively 1341 (17.6%) and 1182 (15.5%) publications over the years.

The 'Pattern' and 'Measure' values given in Table 2 exhibits that Europe ranks first in the production of research on DE, followed by the North and South American countries, Oceania, Asia and Africa.

2. Thematic Distribution of Publications on DE

The distribution of research publications on various subfields / themes have been analysed and the ranking order of the themes based on their importance is presented in Table 3. It is noted from the 'pattern' and 'measure' values that the subjects such as Concepts and theories on DE (G1), the Choice of medium (G9) and Course development (G8) have occupied the first three ranks. The monopoly of publications on these subjects have led the researchers to probe the cause for the wider attention given to them. It becomes obvious that the distance mode of education has been accepted as the only panacea for human resource development by the countries of the world. Hence, there emerged different schools of thought related to the planning, developing and improving the accessibility of distance education to all at a minimum cost. This has accelerated research on varied perceptions and practices of the open learning programmes at different points of time. As a result, the number of research papers on G1 are quite large. The evolution in the concepts and applications of distance learning, have warranted a parallel development in the educational media, communication and information technologies and these have invited a large amount of research on educational telecommunications, education network, teleconferencing, computer-aided instruction, etc., and hence, the number of publications on Choice of medium (G9) is found to be noteworthy. The wider application of IT on DE has necessitated a thorough revamping in the production and distribution of the course materials (G8). This has accelerated research on course authoring, editing and adaptation to satellite technology, electronic mail, etc. However, three subfields viz : Levels of application (G3), Special learner groups (G4), and Areas of application (G2) have attracted less number of papers compared to the other themes of publications.

The thematic and geographic variability in the distribution of research papers were also noted from the results of the C.V. analysis and Dunnett's test given in Table 1.

2. Temporal Distribution of Publications : Regionwise Analysis

The regionwise distribution of publications is also analysed by fitting the polynomial regression function (vide Table 4). Among the regions, a linear trend is noticed for Africa, Europe, and the Oceania. The general trend of publication is found to be on the increase, and it seems to be higher for the pooled data, compared to the other

regions. The annual average growth of publications for the individual regions are found to be in the order of 67 papers for Europe, 38 for Oceania, and 6 for Africa. The coefficient values (x) of these countries are also positive which implies that the publication trend is on the increase as the year moves on.

However, the publications of Asian countries have demonstrated a second degree parabolic regression function, indicating

Table 2: Ranking Order of the Regions Based on Their Publications

S.no	Name of the Regions	Pattern	Measure	Rank
1	Africa	8.386	0.899	5
2	America	4.449	0.477	2
3	Asia	5.765	0.618	4
4	Europe	1.852	0.198	1
5	Oceania	5.093	0.546	3

Table 3**:** Ranking Order of the Subfields / Themes on DE

S.no	Subfields / Themes	Pattern	Measure	Rank
1	Concepts and Theories	1.632	0.150	1
2	Areas of Application	6.450	0.835	10
3	Levels of Application	5.608	0.726	8
4	Special Learner Groups	6.312	0.817	9
5	Methods of Teaching	4.280	0.554	5
6	Psychology of learning	5.252	0.680	7
7	Support Services	5.147	0.666	6
8	Course Development	4.044	0.523	3
9	Choice of Medium	2.026	0.265	2
10	Economics of management	4.080	0.528	4

Table 4: Temporal Distribution of Research Publications : Regionwise Analysis

S.no	Country	Equation fitted	Current Value (1995)	Estimated Value (2005)
1	Africa	6.55758 X - 8.46669	57.11	90
2	America	$-2.1359X^3 + 37.13766X^2 - 139.96X +325.37$	362	580
3	Asia	$5.4053X^2 - 19.822X + 18.52$	361	937
4	Europe	67.2242X - 67.13332	605	941
5	Oceania	38.7697X - 79.7333	308	501
	Total	195.98182X - 329	1631	2611

that there have been a lot of variations in the overall publications of the Asian countries. The publication has witnessed a declining trend at the rate of 19 units during the initial years but, the compound growth rate (x^2) increases by 5 units per annum. It implies that the overall number of publications decrease at an increasing growth rate. The publication output of the American countries have been fitted appropriately into cubic regression function, which reveals that there exists variations in the trend of publications over the years. For instance, the publications have been on the increase at the rate of 140 papers per annum during the initial years, while the compound growth rate is found to be 37 units. But the coefficient value (x) indicates that there is a decline in the later years at the rate of 2 units. The estimated values have also pointed out that, the publication activity of Europe is found to be on the increase (941) immediately followed by Asia (937), America (580) the Oceania (501), and Africa (90). Though there have been a lot of variations in the rate of growth of publications among the sample regions, the overall trend is found to be positive and amount of publications by 2005 is estimated to be 2611 per annum.

4. Temporal Distribution of Research on DE : A Thematic Analysis

The polynomial regression functions fitted to the publication data of the ten selected subfields of DE are presented in Table 5. A mixed trend of publications is noted from the linear and non-linear growth models given above. Among the selected groups, a linear trend is seen in subjects like Concepts and theories (G1), Areas of application (G2), Methods of teaching (G5), Psychology of learning (G6), Choice of medium (G9) and Economics of management (G10). It implies that, the contribution on these themes has been increasing constantly as the time moves on, though at a different rates of growth. For instance, the Choice of medium has invited publication at a rate of 52 paper per annum and in the other thematic groups, the growth of publication has been in the order of 42 papers in G1; 23 in G5; 20 in G10; 12 in G6 and 3 in G2. An overall growth of publications is found to be at a rate of 195 papers per annum.

Also against this, a non-linear pattern of growth at different degrees are noted in themes/subfields like Levels of application (G3), Learner's group (G4), Support services (G7), and Course development (G8). It is seen from the table that a third degree (cubic regression curve) is found to be appropriate for G3 which implies that, though there is an increase in the growth rate at the initial year, the rate of change has witnessed a diminishing return at the middle, and later it has seen an upsurging trend. The fluctuations in the demand for research on this area could be clearly noticed from the curve fitted for this purpose. A second degree (parabolic regression curve) could be seen appropriate for G4, G7 & G8. From the equation it is noted that the publications on these themes have declined at the initial stage, (the sign of the first degree is negative) but, increased later (since 1990), and this is inferred from the coefficient values of (x). However, the overall growth rate is decreasing at an increasing compound growth

rate. In this group, the rate of growth is found to be higher for G8, and it has seen a growth of 27 papers per annum, followed by G7 (6 papers) and G4 (3 papers).

The estimated values indicate that three thematic areas are going to experience an enormous growth rate of publications and these areas are Choice of medium(G9),

Table 5: Temporal Distribution of Research Publications : Thematic Analysis

S.no	Subject / Theme	Equation fitted	Current Value (1995)	Estimated Value (2005)
1	Concept and Theories	41.92122X - 53.86671	36.5 (265)	575
2	Areas of Application	2.9091X - 1.8	27 (21)	41
3	Levels of Application	$-0.73795X^3 + 9.741X^2 - 26.9X + 95.99$	64 (14)	-606
4	Special Learners groups	$0.8258X^2 - 3.55X + 4.03$	53 (55)	140
5	Methods of Teaching	23.024 X - 51.33	179 (171)	291
6	Psychology of Learning	12.4667 X - 19.0667	106 (94)	168
7	Support services	$1.6136X^2 - 6.386X + 23.0995$	121 (123)	290
8	Course Development	$4.6X^2 - 27.4674X + 52.58$	238 (227)	676
9	Choice of Medium	51.6727X - 118.999	398 (390)	656
10	Economics of Management	20.3879X - 32.9334	171 (181)	273
	Total	195.99394X - 328.8667	1631 (1550)	2611

Course development (G8) and Concepts and theories (G1). The number of research papers that would be produced in the year 2005 amounts to 656 in G9, 676 in G8 and 575 in G1. The results have reflected the current trends in exploring all possible means to expand the telecommunication networking technologies, and developing multimedia instructional materials in order to take open learning programmes up to the grass root level. In fulfilling this task, the organisers of distance education programmes need research outputs addressing these issues.

5. Publication performance of the various regions on DE

Since the raw data of publication will not convey information related to the status of research in each subfield, Relative Priority Index (PI) is calculated. From the PI values given in the row and column vectors, the priority profiles of the countries and the geographical profiles of subfields could be inferred. It indicates not only the (a) pattern of development of research on the various subfields of DE in the sample regions, but also pointed out the (b) shifts in the relative importance of certain fields at the global level (i.e. the output of world literature on DE).

(a) Pattern of Development of Research on DE

The distribution of research efforts among the subfields are assessed by the degree of skewness of the PI values. This analysis will help to identify whether the sample

regions have focussed their attention more or less equally among all the subfields or concentrate their effort only on a few fields. It is inferred from the Tables 6a & b, that the research priorities of Africa is more for (i) developing new concepts and theories of DE (PI=179) and (ii) identifying the areas of its application (PI= 226); America's interest lies with the development of educational technologies for popularising open learning (PI=141); Asia seems to focus on (i) economic way of achieving DE(PI=153), (ii) formulating new theories (PI=120), (iii) looking for different levels of application of this programme (PI=120) (iv) and finding out new pedagogical methods of imparting DE(PI=116); Europe's concentration is mainly on (i) widening the levels of application of DE(PI=128) and (ii) improving the support services (PI=121); and the Oceanic countries lay their interest on (i) identifying the special groups (PI=149). There seems to be no uniform pattern of development of research among the regions, as far as the subfields/themes are concerned. The research profiles of the regions are very much differentiated, based on their demographic pattern, manpower requirements, existing institutes of formal and informal learning, communication and other infrastructural availabilities.

(b) *Shifts in the Research Priorities During the Study Period*

In order to identify the shifts in the priority of research over the years, the Priority Index has been calculated for two time spans (1970-75 & 1990-95) (Table 7a). A seven point scale is also used for qualitative description of the priorities (Table 7b). This analysis is used for comparing the (i) the research priorities of a country for different subfields in a given time span; (ii) the research priorities of different countries for a given subfield at different time spans; and (iii) the research priorities of a country for a given subfield at different time spans. A vast difference in the research agenda of the sample regions is noted during the two time periods taken for study.

It is observed that, Africa has given maximum priority to Concepts and Theories of DE (G1) in the first phase and all other fields have been neglected. Later, it has changed its importance to Areas of application of DE (G2), Levels of application (G3), Special learner groups (G4), and Methods of teaching. Similarly, Asia gave maximum priority to Concepts and theories (G1) in the first phase, and later shifted its research interests to Areas of.

Table 6a : Profile of Research Priorities

Regions	**G1**	**G2**	**G3**	**G4**	**G5**	**G6**	**G7**	**G8**	**G9**	**G10**	**Total**
Africa	179.06	226.27	97.41	78.56	104.05	58.67	42.14	92.01	44.36	86.52	100
America	86.94	85.69	89.59	99.46	80.95	112.70	59.85	85.34	141.07	103.92	100
Asia	120.40	120.17	76.64	85.30	116.87	67.86	106.94	94.63	60.50	153.58	100
Europe	94.45	96.51	128.88	87.48	104.39	109.12	121.10	89.41	98.26	91.68	100
Oceania	95.17	82.38	67.56	147.11	98.54	99.32	108.51	149.73	97.77	69.84	100

Table 6b : Areas of Relative Priority

Country	Thrust PI > 175	High 145 < PI < 175	Marginal 115 < PI < 145	Average 85 < PI < 115	Low 55 < PI < 85	Very Low 25 < PI < 55	Neglect PI < 25
Africa	G1,G2	-	-	G3,G5,G8,G10	G4,G6	G7,G9	G2,G4,G5
America	-	-	G9	G1,G2,G3,G4,G6,G8,G10	G5,G7	-	-
Asia	-	G10	G1,G2,G5	G4,G7,G8	G3,G6, G9	-	-
Europe	-	-	G3,G7	G1,G2,G4,G5,G6,G8,G9,G10	-	-	-
Oceania	-	G4,G8	-	G1,G2,G5,G6,G7,G9	G3,G10	-	-

G1 Concept and theories G2 Areas of application
G3 Levels of applications G4 Special learner groups
G5 Methods of teaching G6 Psychology of learning
G7 Support services G8 Course development
G9 Choice of medium G10 Economics of management

Table 7 a : Areas of Relative Priority During 1970 - 75 and 1990 - 95

Priority Index for the Year 1970 - 75

Regions	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	Total
Africa	2 (279)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (100)
America	20 (124)	1 (101)	2 (86)	1 (304)	3 (114)	4 (135)	1 (17)	5 (217)	7 (112)	1 (17)	45 (100)
Asia	2 (279)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (100)
Europe	21 (71)	2 (111)	4 (95)	0 (0)	5 (104)	5 (92)	15 (147)	2 (47)	12 (105)	16 (157)	82 (100)
Oceania	4 (186)	0 (0)	1 (326)	0 (0)	0 (0)	0 (0)	1 (134)	0 (0)	0 (0)	0 (0)	6 (100)
Total	**49**	**3**	**7**	**1**	**8**	**9**	**17**	**7**	**19**	**17**	**137**

Priority Index for the Year 1990 - 95

Regions	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	Total
Africa	56 (171)	6 (253)	4 (116)	5 (122)	20 (117)	6 (65)	10 (99)	11 (59)	20 (52)	13 (82)	161 (100)
America	191 (86)	12 (75)	24 (103)	26 (94)	92 (80)	68 (109)	45 (66)	99 (79)	341 (133)	120 (117)	1018 (100)
Asia	192 (105)	22 (166)	12 (62)	22 (96)	116 (121)	41 (79)	70 (124)	94 (90)	123 (57)	154 (174)	846 (100)
Europe	378 (101)	19 (70)	52 (132)	38 (81)	198 (102)	104 (99)	111 (98)	209 (99)	472 (108)	142 (78)	1723 (100)
Oceania	189 (95)	14 (97)	14 (67)	35 (140)	99 (95)	65 (116)	74 (121)	157 (139)	217 (94)	58 (60)	922 (100)
Total	**1006**	**73**	**106**	**126**	**525**	**284**	**310**	**570**	**1173**	**487**	**4660**

Figures in Paranthesis indicate the PI values

Table 7b : Areas of Relative Priority

Country	Year	Thrust	High	Marginal	Average	Low	Very Low	Neglect
Oceania	70-75	G1,G3	-	G7	-	-	-	G2,G4, G5,G6,
	90-95	-	-	G4,G6, G7,G8	G1,G2, G5,G9	G3,G10	-	G8,G9, G10
Africa	70-75	G1	-	-	-	-	-	G2,G3, G4,G5,
	90-95	G2	G1	G3,G4, G5	G7	G6,G8, G10	G9	G6,G7, G8,G9, G10
America	70-75	G4,G8	-	G1,G6	G2,G3, G5,G9	-	-	G7,G10
	90-95	-	-	G9	G1,G3, G4,G6, G10	G2,G5, G7,G8	-	-
Asia	70-75	G1	-	-	-	-		G2,G3, G4,G5,
	90-95	-	G2,G10	G5,G7	G1,G4, G8	G3,G6, G9	-	G6,G7, G8,G9, G10
Europe	70-75	-	G10,G7	-	G2,G3,G5, G6,G9	G1	G8	G4
	90-95	-	-	G3	G1,G5,G6, G7,G8,G9	G2,G4, G10	-	-

application (G2), Methods of teaching (G5), Support services (G7) and Economics of management (G10) in the second phase.

The North and South American countries have focused their research effort on Special learner groups (G4), Psychology of learning (G6), and Course development (G8) in the early period, but later changed to Choice of medium (G9). As against this, Europe has given maximum attention to areas like Support services (G7) and Economics of management(G10) in the early 70's and shifted to Levels of application (G3) in the 90's. In the same way Oceanic countries have given more weight to areas like Levels of application (G3) and Support service (G7) in the early years and later diverted its attention to areas like Special learner group (G4), Psychology of learning (G6) and Course development (G8).

CONCLUSION

It is interesting to observe from the analysis that the researchers on DE have worked on ten major areas covering the conceptualisation, areas and levels of application, identifying the learning groups and their psychology, designing the methodology of

teaching, support services, medium of delivery and economic way of managing the system. The contribution of papers on these areas has seen an upward trend as time moves on, though at a varying rate of growth. Of all the fields of research, the quantum of publication is found to be higher for the medium of delivering the pro-grammes, as it invites publication at a rate of 52 papers per annum. The esti-mated value implies that this field would witness an enormous growth of 656 papers per annum during 2005. A parallel research development is noticed in the preparation of course materials and it reflects the interdependency of these two fields. The publication profiles of the various regions indicate that the contribution of European countries has accounted for 40% of the total research productivity on DE, immediately followed by North and South American countries that have produced 23%, Asia 18%, Oceania 16% and Africa 3% of research papers. The annual average growth of publications has shown a posi-tive trend and it has grown at a rate of 67 papers in Europe, 38 in Oceania and 6 in Africa. The trend of publications from the other two regions has been found to be non-linear, indicating the variations in the growth of publication over the years. The estimated values reveal that the publication of Europe would be 941 by 2005 followed by Asia (937), America (580), Oceania(01) and Africa (90). The pattern of research publication is not found to be uniform, in the sense that each region has concentrated on a definite area of research that could address their regional problems. There is also found to be a lot of shifts in the research priorities of the regions, reflecting the changes in the problem to be handled by them at different points of time.