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RESEARCH ARTICLE

'Association of Demographic Variables versus Frequency of Use of Aerospace Gateways': A Survey of Aerospace Scientists and Engineers of Bangalore

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Abstract

A Gateway is a network point that acts as an entrance to another network. They are broadly classified into (a) Library Gateways or (b) Subject Specific Gateways (vortals). These Gateways contain enormous web resources that have been thoroughly evaluated and its quality of information checked by respective subject experts. A research survey was undertaken to ascertain the 'Association of Demographic Variables versus the Frequency of Usage of Aerospace Gateways' amongst the aerospace scientists and engineers of selected 16 aerospace organizations of Bangalore. The major findings of this study are: The $\chi 2$ test indicates that the demographic variable, viz., Category Wise Distribution of the Respondents($\chi 2$=15.411, P Value = 0.004), Occupation($\chi 2$=54.822, P Value = 0.000) and Specialization($\chi 2$=38.547, P Value = 0.008) by 'Frequency of Use of Aerospace Gateways' have significant association. This implies that the percentage of preference for the above mentioned demographic variables are not approximately the same *[Not Uniformly Distributed]*. The $\chi 2$ tests for the remaining demographic variables, namely, Gender, Age-Group and Qualification by the 'Frequency of Use of Aerospace Gateways' have no significant association. This implies that percentages of preference for these demographic variables are approximately the same *[Uniformly Distributed]*.

Introduction

I. INTRODUCTION

Basically a Gateway is a network point that acts as an entrance to another network. Generally, there are two kinds of Gateways: (a) Library Gateways: which are collections of databases and information sites, arranged by subject, that have been assembled, reviewed and recommended by specialists, usually librarians. These Gateway collections support research and reference needs, by identifying and pointing to recommended, academically-oriented pages on the Web; (b) Subject Specific Databases(Vortals): generally devoted to a single subject, created by professors, researchers, experts, governmental agencies, business interests and other subject specialists who have a deep interest in the subject. Usually libraries are accessed and used when one wants to look for high quality information sites on the Web. One can be pretty sure that these Gateways have been reviewed and evaluated by subject specialists for their accuracy and content.

Subject gateways contain web resources that have been evaluated and quality checked by subject experts. They provide search facility, information, links to related sites and resources such as Electronic Journals (Open Access or subscription based), Discussion Groups, Mailing lists and many specialized user facilities required to the users of

Specific Discipline. The resources on subject gateways are selected by an editorial review process.

According to **[1],** Subject gateways are web sites that compile complete information on various resources available on a particular subject. The compilation process is undertaken by information professionals and subject experts and the information links shown by these services will in all probability be 100 per cent authentic.

Characteristic Features of Subject Gateways:

- ***Subject Specific:*** Gateways are subject-centric. They host only information related to a particular subject. If a researcher is doing his research on a particular subject he/she need not have to go to a search engine, which generally dishes relevant and also irrelevant links without looking at the context. The researcher can simply go to the gateway that provides information on the subject of his/her interest.

- ***Quality of the Resource:*** One of the most common hardships faced by a researcher for acquiring material from the Net is to ascertain the quality and authenticity of the desired or located resource. This is really important in this age of information overload especially if one is a serious researcher or industry analyst. In Gateways, the subject experts, using well-established techniques check and filter out the data gathered by gateways. This in turn becomes a big solace for the researcher in this regard.

- ***Data Scientifically Organized:*** One of the main objectives of subject gateways is to provide an easy mechanism for users to access the resources compiled and stored in the gateway database. So here, the gateways are guided by the traditional library model that has got excellent tools to store/disseminate information in the real world. The resources collected by the gateway subject experts are properly catalogued and classified using data organization and classification schemes adopted and built on traditional and well-established principles of library science. All the more, subject gateways can be considered the Net equivalent of a library. The role of an experienced librarian, who is well versed in the techniques of data organization and retrieval, has become all the more important **[1].**

It would not be wrong in saying that, subject based information gateways are one approach to Internet resource discovery

II. REVIEW OF LITERATURE

Freshwater inter-alia quotes Sladen and Spence **[2]** by saying that Subject Gateways have significant advantages: While offering a single point of access to Internet-based resources in a given field, selective subject gateways have one key feature which distinguishes them from more commercial enterprises – they are characterized by a quality control methodology based on skilled human input from the relevant academic discipline.

He also inter-alia quotes **Koch [2]** by saying that 'A Subject Gateway is an Internet service with a primary focus on distributed Internet resources … which support systematic resource discovery … The service is based on resource description. Browsing access to the resources via a Subject structure is an important feature. Also, Quality controlled Subject Gateways are Internet services which apply a rich set of quality measures to support systematic resource discovery. Considerable manual effort is used to secure a selection of resources which meet quality criteria and to display a rich description of these resources with
Standards based metadata.

The Desire information Gateways Handbook [3] states that: One of the key roles of Internet Subject Gateways is the creation of descriptive metadata about networked resources which can be used as a basis for searching and browsing the Gateway. These descriptions can also help Gateway users to identify whether the resources are really what they need, potentially saving them a considerable amount of time browsing through the … information available elsewhere on the Internet.

According to **Houghton et al., [4,5,6],** in his report mentions that less than a third of all researchers viewed mediated subject gateways, including institutional gateways and those provided as part of the Resource Discovery Network, as essential to their research (Education for Change 2001). The author *inter-alia* quotes Friendlander who in her report mentions that, Friedlander (2002) found that when searching for material to study, more than 80% of the faculty and students in her U.S.-based sample searched for information online. No more than 10-15% of U.K.-based researchers rated personal portals as 'very important', but institutional gateways and portals, online catalogues, and subject gateways and portals were somewhat more highly regarded.

III. AERADE'S AND IAIN'S (INTERNATIONAL PIONEERING INITIATIVES IN FACILITATING THE USE OF AEROSPACE ELECTRONIC INFORMATION RESOURCES

The Aerospace Information Management – UK (AIM-UK) project – found compelling evidence of 'under-utilization' of 'Electronic Information Resources' by the aerospace scientists and engineers. It recommended a number of initiatives to raise awareness and improve access to useful electronic information resources, and to reduce the threat of 'information overload'. In particular, there was a call to establish an Internet Gateway and Portal to the aerospace and defence community that would act as a 'jumping-off-point' for effective exploration and retrieval of information on the WWW. Launched in November, 1999, AERADE is specifically designed to meet this need. It is an initiative developed by the Cranfield University to enable aerospace and defence experts to find relevant information on the Internet. Today, the reports archive is a historical collection of over 10,000 significant technical papers and reports produced by the Aeronautic Research Council (ARC) and the National Advisory Committee for Aeronautics (NACA), **Hanley; Harrington and Blagden, [7].**

In the Spring of 1995, the Technical Information Committee (TIC) of the NATO Advisory Group for Aerospace Research and Development (AGARD) set up a Working Group to examine the issues, strategies, and actions required to develop and establish an International Aerospace Information Network (IAIN). The intention was to develop a mechanism for improving the access to, and use of, aerospace and aerospace-related information, by developing a self-sustaining, worldwide, network of partner organizations committed to sharing their data and information resources. After exploring a number of options, and evaluating the many existing models of international cooperative databases, the Working Group decided that the Internet would be the most suitable vehicle to provide such a mechanism, and developed a prototype IAIN Homepage to be used as a Proof of Concept. The prototype Homepage was inaugurated in April 1997 and now provides a limited catalog of aerospace information sources from which information searches can be launched. These sources will be expanded as new sources are identified.

The success of this concept will be determined primarily on its ability to deliver the desired data and information and needed services to the user. It should include:

- the ability to search for aerospace and aerospace-related data and information across
- aerospace and aerospace-related data directory information
- the facility to order data products through a simplified "one-stop shopping" procedure the delivery of data to users on a variety of standard media, including electronic delivery where heterogeneous systems appropriate.

The Mission of AGARD: According to its Charter, the mission of AGARD is to bring together the leading personalities of the NATO nations in the fields of science and technology relating to aerospace for the following purposes:

- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community
- Providing scientific and technical advice and assistance to the Military Committee in the field of aerospace research and development (with particular regard to its military application)
- Continuously stimulating advances in the aerospace sciences relevant to strengthening the common defence posture
- Improving the co-operation among member nations in aerospace research and development
- Exchange of scientific and technical information
- Providing assistance to member nations for the purpose of increasing their scientific and technical potential
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field.

The mission of AGARD is carried out through the Panels which are composed of experts appointed by the National Delegates, the Consultant and Exchange Programme and the Aerospace Applications Studies Programme. Participation in AGARD activities is by invitation only and is normally limited to citizens of the NATO nations, **Walter [8].**

IV. CSIR-NATIONAL AEROSPACE LABORATORIES, BANGALORE

The National Aerospace Laboratories is India's premier civil aviation R&D aerospace research organization in the country. Its main mandate is the 'Development of aerospace technologies with strong science content and with a view on their practical application to the design and construction of flight vehicles'. NAL is also required 'to use its aerospace technology base for general industrial applications'. 'Technology' would be its core engine-driver for the future. NAL is also best known for its main sophisticated aerospace R&D testing facilities which are not only unique for this country but also comparable to similar facilities elsewhere in the world**.**

V. OBJECTIVES OF THE STUDY

- To determine whether there is significant association of Demographic Variables versus Frequency of Use of Aerospace Gateways' amongst the aerospace scientists and engineers of Bangalore.

- To see whether the 'Association of Demographic Variables versus the Frequency of Use of Aerospace Gateways' are either uniformly or non-uniformly distributed in the present study.

VI. NULL HYPOTHESIS

- There is no association between the 6 demographic variables, namely, (a) Category wise distribution of the respondents, (b) Occupation profile, (c) Gender, (d) Age groups, (e) Qualification and (f) Specialization of the respondents and the 'Frequency of Use of Aerospace Gateways' by the Aerospace Scientists and Engineers.

VII. MATERIALS AND METHODS

The present study is restricted to the selected 16 prominent aerospace organizations in Bangalore. A total number of 650 survey questionnaires were distributed amongst the aerospace scientists and engineers belonging to these 16 aerospace organizations. A total number of 612 questionnaires were received back finally 583 (89.7%) were selected for the study which were found suitable for the study.

A survey questionnaire has been used to conduct this research study. The total population size of this research study is restricted to the 1220 aerospace scientists and engineers in Bangalore. The distribution of Source Data is indicated in *Table 1*. Random sampling technique has been used for selection of the sample size.

The association of the 6 main Variables of Demography chosen for the study, viz., (a) Category wise distribution of the respondents [Aerospace Scientist / Aerospace Engineer], (b) Occupation, (c) Gender, (d) Age, (e) Qualification and (f) Specialization of the Aerospace Scientists and Engineers with the 'Frequency of Use of Aerospace Gateways', viz., (1) ERAU: Embry Riddle Aeronautical University, ERAU, USA (http://www.erau.edu/libraries/virtual), (2) AERADE: Aerospace Defense Resources from, Cranfield University, (3) GALCIT: Graduate Aeronautical Laboratories, California Institute of Technology (CALTECH), (4) IAIN: International Aerospace Information Network (TIC, NATO, AGARD), (5) FAA: Federal Aviation Administration (http://www.faa.gov), (6) NASA: National Aeronautics and Space Administration (http://www.nasa.gov), (7) Space Today Online (http://www.spacetoday.org), (8) Yahoo Index for Aeronautics and Aerospace (http://dir.yahoo.com/Science/Aeronautics and Aerospace) are presented in Table 2.

The analysis of 'Association of Demographic Variables versus Frequency of Use of Aerospace Gateways' amongst the aerospace scientists and engineers of the selected 16 aerospace organizations of Bangalore is shown in *Table 2.*

Table-1: Distribution of Source Data (Sample Size)

Sl.No.	Organizations	No. of Questionnaires distributed	No. of Questionnaires received	No. of usable questionnaires usable
1.	ADA	67	63	58
2.	AFTC	19	16	15
3.	ADE	14	12	12
4.	ASTE	33	30	29
5.	CABS	16	15	14
6.	CEMILAC	33	30	29
7.	C-MMACS	8	6	6
8.	DARE	11	9	9
9.	LRDE	5	3	2
10.	GTRE	24	22	21
11.	HAL	144	140	134
12.	IAM	40	36	33
13.	ISRO-ISTRAC	25	24	22
14.	IISc	38	37	34
15.	JNCASR	5	3	1
16.	NAL	168	166	164
Total		**650**	**612**	**583 (89.7%)**

Geographical Boundary of the Study (16 Prominent Aerospace Organizations of Bangalore, INDIA).

Key: ADA=Aeronautical Development Agency, **AFTC**=Air Force Technical College, **ADE**=Aeronautical Development Establishment, **ASTE**=Aircraft Systems Testing Establishment, **CABS**=Centre for Airborne Systems, **CEMILAC**=Centre for Military Airworthiness and Certification, **C-MMACS**=Centre for Mathematical Modeling and Computer Simulation, **DARE**=Defense Avionics Research Establishment, **LRDE**=Electronics and Radar Development Establishment, **GTRE**=Gas Turbine Research Establishment, **HAL**=Hindustan Aeronautics Limited, **IAM**=Institute of Aerospace Medicine, **ISRO-ISTRAC**=Indian Space Research Organization, **IISc**=Indian Institute of Science, **JNCASR**=Jawaharlal Nehru Centre for Advanced Scientific Research, **NAL**=National Aerospace Laboratories.

Table-2: Association of Demographic Variables versus Frequency of Use of Aerospace Gateways

CATEGORY WISE DISTRIBUTION	Category V/s. Frequency of Use of Aerospace Gateways					Total
	Never Use	Monthly	Fortnightly	Weekly	Daily	
Aerospace Scientist	84	152	33	22	4	295
	(28.5)	(51.5)	(11.2)	(7.5)	(1.4)	(100.0)
Aerospace Engineer	122	126	27	9	4	288
	(42.4)	(43.8)	(9.4)	(3.1)	(1.4)	(100.0)
Total	206	278	60	31	8	583
Percent	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi-Square and P Value	$\chi^2 = 15.411$, P=0.004					
OCCUPATION PROFILE	Occupation V/s. Frequency of Use of Aerospace Gateways					Total
	Never Use	Monthly	Fortnightly	Weekly	Daily	
Scientific/ R & D	76	184	41	21	5	327
	(23.2)	(56.3)	(12.5)	(6.4)	(1.5)	(100.0)

Armed Forces	42	28	6	5	0	81
	(51.9)	(34.6)	(7.4)	(6.2)	(0.0)	(100.0)
Teaching & Research	16	19	1	1	0	37
	(43.2)	(51.4)	(2.7)	(2.7)	(0.0)	(100.0)
Managers	72	47	12	4	3	138
	(52.2)	(34.1)	(8.7)	(2.9)	(2.2)	(100.0)
Total	206	278	60	31	8	583
Percent	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi-Square and P Value	$\chi^2 = 54.822$, P=0.000					

GENDER PROFILE	**Gender V/s. Frequency of Use of Aerospace Gateways**					**Total**
	Never Use	**Monthly**	**Fortnightly**	**Weekly**	**Daily**	
Female	25	37	3	5	1	71
	(35.2)	(52.1)	(4.2)	(7.0)	(1.4)	(100.0)
Male	181	241	57	26	7	512
	(35.4)	(47.1)	(11.1)	(5.1)	(1.4)	(100.0)
Total	206	278	60	31	8	583
Percent	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi-Square and and P Value	$\chi^2 = 3.677$, P=0.452					

AGE-GROUP	**Age Group V/s. Frequency of Use of Aerospace Gateways**					**Total**
	Never Use	**Monthly**	**Fortnightly**	**Weekly**	**Daily**	
21-30	71	99	24	15	1	210
	(33.8)	(47.1)	(11.4)	(7.1)	(0.5)	(100.0)
31-40	72	77	20	8	3	180
	(40.0)	(42.8)	(11.1)	(4.4)	(1.7)	(100.0)
41-50	40	75	9	3	3	130
	(30.8)	(57.7)	(6.9)	(2.3)	(2.3)	(100.0)
51-60	23	27	7	5	1	63
	(36.5)	(42.9)	(11.1)	(7.9)	(1.6)	(100.0)
Total	206	278	60	31	8	583
Percentage	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi-Square and P Value	$\chi^2 = 14.648$, P=0.261					

QUALIFICATION	**Qualification V/s. Frequency of Use of Aerospace Gateways**	**Total**

	Never Use	Monthly	Fortnightly	Weekly	Daily	
Doctorate Degree	22	54	7	2	1	86
	(25.6)	(62.8)	(8.1)	(2.3)	(1.2)	(100.0)
Masters Degree	85	123	28	16	5	257
	(33.1)	(47.9)	(10.9)	(6.2)	(1.9)	(100.0)
Bachelors Degree	96	100	25	13	2	236
	(40.7)	(42.4)	(10.6)	(5.5)	(0.8)	(100.0)
Diploma	3	1	0	0	0	4
	(75.0)	(25.0)	(0.0)	(0.0)	(0.0)	(100.0)
Total	206	278	60	31	8	583
Percent	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi-Square and P Value	$\chi^2 = 16.478$, P=0.170					

SPECIALIZATION	**Specialization V/s. Frequency of Use of Aerospace Gateways**					**Total**
	Never Use	**Monthly**	**Fortnightly**	**Weekly**	**Daily**	
Thermal & Fluid Sciences	18	52	9	5	1	85
	(21.2)	(61.2)	(10.6)	(5.9)	(1.2)	(100.0)
Avionics, Guidance and Control	31	61	15	7	2	116
	(26.7)	(52.6)	(12.9)	(6.0)	(1.7)	(100.0)
Aerospace Structures and Allied Mechanical Sciences	20	29	13	6	0	68
	(29.4)	(42.6)	(19.1)	(8.8)	(0.0)	(100.0)
Materials and Metallurgy	13	16	0	0	0	29
	(44.8)	(55.2)	(0.0)	(0.0)	(0.0)	(100.0)
Flight Operations and other Allied Disciplines	22	19	5	1	0	47
	(46.8)	(40.4)	(10.6)	(2.1)	(0.0)	(100.0)
General Engineering and Support Sciences	102	101	18	12	5	238
	(42.9)	(42.4)	(7.6)	(5.0)	(2.1)	(100.0)
Total	206	278	60	31	8	583
Percent	(35.3)	(47.7)	(10.3)	(5.3)	(1.4)	(100.0)
Chi – Square and P Value	$\chi^2 = 38.547$, P=0.008					

Key 1: FREQUENCY OF USE OF AEROSPACE GATEWAYS: (1) ERAU: Embry Riddle Aeronautical University, ERAU, USA (http://www.erau.edu/libraries/virtual), (2) AERADE: Aerospace Defense Resources from, Cranfield University, (3) GALCIT: Graduate Aeronautical Laboratories, California Institute of Technology (CALTECH), (4) IAIN: International Aerospace Information Network (TIC, NATO, AGARD), (5) FAA: Federal Aviation Administration (http://www.faa.gov), (6) NASA: National Aeronautics and Space Administration (http://www.nasa.gov), (7) Space Today Online (http://www.spacetoday.org), (8) Yahoo Index for Aeronautics and Aerospace (http://dir.yahoo.com/Science/Aeronautics and Aerospace).

Key 2: Figures in Brackets indicate Percentages

VIII. RESULTS AND DISCUSSION

 The $\chi 2$ test indicates that the demographic variable, viz., Category Wise Distribution of the Respondents($\chi 2$=15.411, P Value = 0.004), Occupation($\chi 2$=54.822, P Value = 0.000) and Specialization($\chi 2$=38.547, P Value = 0.008) by 'Frequency of Use of Aerospace Gateways' *have significant association*. The $\chi 2$ tests for the remaining demographic variables, namely, Gender, Age-Group and Qualification by the 'Frequency of Use of Aerospace Gateways' *have no significant association.*

IX. CONCLUSION

The main conclusions that the authors would like to infer in this paper are:

 The $\chi 2$ test indicates that the demographic variable, viz., Category Wise Distribution of the Respondents($\chi 2$=15.411, P Value = 0.004), Occupation($\chi 2$=54.822, P Value = 0.000) and Specialization($\chi 2$=38.547, P Value = 0.008) by 'Frequency of Use of Aerospace Gateways' *have significant association*.

 This implies that the percentage of preference for the above mentioned demographic variables are not approximately the same *[Not Uniformly distributed]*.

 The $\chi 2$ tests for the remaining demographic variables, namely, Gender, Age-Group and Qualification by the 'Frequency of Use of Aerospace Gateways' *have no significant association.*

 This implies that percentages of preference for these demographic variables are approximately the same *[Uniformly distributed]*.

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Dr Ramachandran Guruprasad received his MLIS degree from Annamalai University (1994), MSc in Information Technology from Karnataka State Open University (2006) and a Ph.D. Degree in Library and Information from the University of Mysore (2010). He has two international books to his credit, several book chapters, international conference presentations and national and international journal publications. His areas of interest and specialization include: analyzing the 'Use Patterns of Electronic Information Resources among Scientists, Engineers and Technologists', 'Digital Content Management', 'Digital Video Archiving'. He has also played a significant role as a Digital Footage expert in research, planning and execution of several R&D documentaries in the Aerospace Domain. Presently he holds the position of a Scientist at CSIR-NAL (Knowledge and Technology Management Division), Bangalore.