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Measuring the success of intervention programmes designed to increase the participation rate by women in computing

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Abstract

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Keywords

women, rate, participation, computing, increase, measuring, designed, programmes, intervention, success

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MEASURING THE SUCCESS OF INTERVENTION PROGRAMMES DESIGNED TO INCREASE THE PARTICIPATION RATE BY WOMEN IN COMPUTING

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Abstract

Many intervention programmes to encourage greater female participation in computer education and careers have been conducted in the last twenty years. These intervention programmes take considerable time, effort and money to design and implement. If success were to be measured by an increase in the percentage of female students undertaking computing courses then these programmes would have to be considered a failure. This paper describes a research project which examined fourteen intervention programmes in detail. From the perspective of the programme champions each of the intervention programmes was considered successful, even when this success was restricted to specific areas or limited to small groups of individuals. Formal evaluation appeared to have been an afterthought rather than a priority of many of the programme champions. Some programmes appeared to be less effective due to the lack of targeted and clear goals or predetermined evaluation criteria. It is recommended that during the initial planning phase for intervention programmes a clear objective is to consider what a successful programme would look like and what the evaluation criteria would be. Further work is needed to understand how intervention programmes can be better designed and evaluated so that their impact and success can be expanded.

Keywords: Gender, Computing, Recruitment, Intervention programmes, evaluation.

1 INTRODUCTION

Gender imbalance in specific discipline areas, or occupations, becomes a problem when the gender spread has a detrimental effect on some sections of society. For both men and women there are areas of the workforce where either dominates and one of these areas is computing. The early history and development of computing included significant contributions from women but as the discipline has evolved the number of women entering the profession has declined. While the computing profession is still relatively young it employs over a quarter of a million people in Australia yet less than 20% of these workers are women.

The philosophical viewpoint taken in this paper is that the field of computing has been socially constructed as a male domain and therefore while women are capable of taking their place in this field, at present, they are choosing not to. Lazowska (2002, p. 11) suggests that of the many reasons why we should be working to increase the number of women in computing 'the selfish reason is the most compelling one: the quality of the solutions we achieve is enhanced by the diversity of the individuals contributing to these solutions'. This paper presents a research project which examined fourteen intervention programmes and reports on the achievements of those programmes. The criteria used to

measure success and the characteristics of those programmes that were regarded as successful are presented and discussed.

2 BACKGROUND

If women are not part of the technology solution design then it is unlikely that technology will represent their needs or their family's needs. As Borg (2001) reflected technology for the future will depend on the designers, builders and controllers as well as those who use it.

> *… involving women in technology - how it is taught, learned, created and used - benefits everyone. …. It's about bringing the talents of technical women leaders to bear on developing more competitive products and finding solutions to problems that impact our lives, our nation and our world.* (Anita Borg Institute for Women and Technology, n.d.)

Woszcynski, Beise, Myers and Moody (2003, p. 1585) express the concern that without sufficient women in the computing workforce development of 'technology pursuits may focus more on doing things faster, and less on doing new things that reflect alternative perspectives'. This was also the focus behind the creation of the Virtual Development Center in 1999, a programme of the Anita Borg Institute for Women and Technology. The authors highlight the importance of technology for improving the human condition generally and then pose a number of critical questions:

> *But what are the problems technology is attempting to solve? Whose priorities are represented? How much of technology truly benefits the world's peoples? Who are the creators of technology? The creators of most of our current technology, however, represent a narrow stratum of the world's population – North American males.* (Anita Borg Institute for Women and Technology, n.d.)

Wulf (1998) explains that with a gender imbalance in the engineering workforce 'we limit the set of life experiences that are applied, and as a result, we pay an opportunity cost, a cost in products not built, in designs not considered, in constraints not understood, in processes not invented'. This is equally true of computing and consequently computing is another area where gender imbalance is of concern and needs to be addressed. To ensure that technology is useful for all, a diverse blend of people is needed to design, develop and implement new systems (Camp 2001). Camp (2001) argues that to create better technology more women are needed to be incorporated in development teams as they bring different perspectives, different points of view and different ways of solving problems thus broadening the systems development process. Without women in the computing workforce the different perspective, priorities and operating styles women bring to the design and development of systems is lost (WSET 1995) resulting in systems that may not be useful to the whole population.

The impact of the absence of women in design and development can be best illustrated by examples:

- Margolis and Fisher (2002) report on a voice-recognition system which was calibrated to male voices only and therefore not able to hear women's voices. A video conference system built around this software, where the camera automatically focused on the person speaking, could not hear the women and therefore the women were also not seen.
- Tests conducted on the first airbags showed that they saved lives. However, once in use, women and children were injured and even killed by inflating airbags. A study reported in the American Journal of Public Health described how the induced injuries from airbags were 'disproportionately borne by female drivers' (Segui-Gomez 2000, p. 1575). The original design team had been made up almost exclusively of men (Coonan 2006) and the initial tests had all been conducted with a 50-percentile male crash-test dummy, which was the size of the average American male (Nikkel n.d.). If there had been more women involved in its development, the fatal flaws in the airbag may have been avoided.

There are also examples from science and engineering which 'show how a product–design group that is not representative of its users can go wrong' (Margolis and Fisher 2002, p. 3):

- Artificial heart valves were sized exclusively to the male heart by a mostly male design team (Margolis and Fisher 2002).
- The theories about the preventative benefits of taking one aspirin a day were tested on 22,000 men (Kolata 1990) but reported in such a way that they applied to both men and women (Pear 2000). Yet men and women can respond differently to the same drug (Buring 2000).

Although these examples highlight mainly physical and physiological differences, the creation of technology and computing environments that benefit all of society requires diverse perspectives in developmental and organisational areas also. Brown (2007, p. 334) concludes it 'is not that men are incapable of representing women's interests, but that men generally lack the necessary experiences to consistently and competently raise issues that tend to concern women more than men'. Unless more women are employed in computer design and development, these products and services are unlikely to meet the needs and desires of approximately half the population. The current loss of available knowledge from women in IT development can only be considered to be a loss for society as a whole.

Women need to be actively involved in all levels of these new technologies that have such immense potential for social change.

3 THE COMPUTING EDUCATION PIPELINE

Valenduc et al. (2004, p.10) argue that 'Professional ICT skills are required in the ICT industry and in related jobs in the user industries, in order to create, develop, implement, repair or manage ICT tools (hardware, networks and software)'. Consequently the acquisition of appropriate computing skills and qualification via education is necessary.

Right along the education pipeline, from primary school to secondary school to tertiary institutions there are fewer girls choosing to study computing. In Australia, as in other countries, this issue was first identified as of concern in the early 1980s. The Australian government set a target that, by 1995, 40% of students within tertiary computing courses would be female (DEET 1990). This prompted a range of strategies to encourage the uptake of computing studies by female students. In Australia, as elsewhere where this same imbalance is an issue, numerous intervention programmes aimed at encouraging more female students to consider computing and successfully complete courses have been conducted. Initiatives have ranged from mentor programmes, the production of videos, special classes for female students, curriculum changes to create a more inclusive curriculum, to the running of workshops and computer camps (Greenhill et al. 1997b; Craig et al. 1998; Clayton and Lynch 2002). Intervention programmes have also been created to equip students with the necessary skills needed to work in this field. Other programmes have aimed to provide the necessary contacts to obtain jobs; while yet others have focussed on how to obtain career recognition and for support to stay in the industry.

Statistics however show no improvement in the rate of participation of females in this industry and anecdotal evidence suggests that these intervention programmes have not been as successful or effective as was anticipated. If success is measured, albeit simplistically, by the current percentage of females in tertiary computing courses, then the programmes must be seen as a failure with a decline from 27.2% in the 1990s (Lang 2003) to less than 20% of current tertiary computing students being female (DEST 2008). This view however is too simplistic, as there is no way of knowing what the percentage of females in computing would have been *without* the intervention programmes. The government's target level of 40% has, however, certainly never been reached.

This raises questions about the efficacy of the intervention programmes, given the considerable efforts of many to raise the level of involvement of females in computing. Were any of the initiatives successful? How is success defined? How can success be measured?

4 THE RESEARCH METHOD

The aim of this research was to investigate gender-equity intervention programmes, focusing on the enrolment and retention of female students in computing courses in Australia, over the last twenty years. A collective case study of 14 individual intervention programmes was undertaken. Each of these cases was a concentrated inquiry into a particular intervention programme: Each case was investigated individually to try to understand *its* complexities (Stake 2000).

Research questions included:

- How did, or do, these programmes operate?
- To what extent have these programmes been successful from the initiators perspective?
- To what extent have these programmes been evaluated by those initiating the programmes?
- What criteria were used to measure success?

Data was collected via detailed document and artefact analysis and by in-depth interviews with the instigator/leader of each of the programmes. The analysis of each individual case was followed by a cross-case comparison.

Within the context of qualitative case study research in the computing discipline, the number of case studies (14) is consistent with other research (Orlikowski and Bardoudi 1991). Myers (2002) queries why more than one case is actually necessary but Miles and Huberman (1994) suggest cross-case analysis enhances generalisability as a multiple-case design will deepen the understanding and ability to explain what has occurred. Herriott and Firestione (1983 as cited in Yin 1994, p. 45) suggest that the evidence from multiple cases is more compelling and therefore the study will be more robust then one of single-case design.

Miles and Huberman (1994) suggest that a multiple-case study requires clear choices about which cases to include within the study. The intervention programmes which became the case studies for this research were selected on the following basis:

- One of the programme's objectives was to increase the number of females who were part of the computing field.
- The programme could be made up of one or more projects however the programme needed to be a sustained activity.
- The principal champion/instigator of the programme was prepared to participate in this research.
- The programme and projects could be completed or be ongoing.
- The programmes were chosen to provide diversity in location and focus.
- How long the programme ran for, it was assumed longer term programmes would be more successful.

Intervention programmes have been conducted by three different types of entities in Australia; educational institutions, government bodies and industry groups. Eight cases were selected from universities, three from government bodies and three from industry groups. A greater number of case studies were chosen from the university sector than the other sectors due to the proliferation of such activities in this sector.

For each case study the programme leader or a major contributor was interviewed. However additional interviews were conducted for five of the case studies either because there were joint programme leaders or another major contributor was available and willing to be interviewed. A total of 19 interviews were conducted. For four of the case studies two people were interviewed and in one instance a third person was interviewed. Interview times ranged from approximately 60 minutes to 100 minutes in duration. For privacy reasons the interview participants are identified by pseudonyms and will be refereed to as the programme's champion in further discussion. Additional data for each case study came from the detailed study of documents and artefacts (consisting in total of 40 published and 10 unpublished papers, 17 reports, 32 surveys, 6 videos and 12 websites). These

documents/artefacts were investigated for detailed descriptions of the intervention programmes in context, as well as evidence of evaluation or the absence of evaluation.

Easterby-Smith, Thorpe and Lowe (1995) suggest that analysis of in-depth interviews initially requires the researcher to become familiar with the material and then to reflect upon it. Familiarisation of the data was strengthened via thorough re-reading of the transcripts. A set of themes and sub-themes important for understanding what was going on then began to develop. The interview transcripts were subsequently incorporated into NVivo 7 software. While such software can support the analysis of qualitative data, by searching, linking, marking and so on, it can not undertake the analysis and decide what all the text means. As Weitzman and Miles (1995, p. 330) explain; computer 'software will never 'do' theory building for you…, but it can explicitly support your intellectual efforts, making it easier for you to think coherently about the meaning of your data'.

The documents and other artefacts collected also underwent the stages of familiarisation and reflection. Videos were watched, websites were explored, and support materials examined. In NVivo a 'notes section' was created, one for each of the case studies, and relevant facts and reflections were recorded as the researcher investigated the artefacts thereby creating a chain of evidence. Next other documents (such as evaluation reports, grant applications and research publications) were carefully re-read and entered into NVivo. This process brought together all the data for analysis, regardless of its source, into one NVivo project file enabling sorting, searching and linking. Having all the data in one project file within NVivo also enabled the creation of a meta-matrix as described by Miles and Huberman (1994) to facilitate an analysis for patterns in responses and opinions. Yin (1994) agrees that this approach is a good method for analysing multiple-case study data.

5 THE RESULTS

5.1 The Programmes

Of the fourteen case studies explored eight studies centred on programmes developed in academia through universities, three were state government initiatives, and three were developed by industry bodies (see Table 1). The geographic locations of these organisations span the entire breadth of Australia. At the conclusion of the research, six of the programmes were still highly active but in eight activities have stopped, or were operating only at a minimal level.

Organisation	Number of Cases	Limited / No Activity	Highly Active
Academic	8	7	1
Government	3	1	2
Industry	3	0	3
Total	14	8	6

Table 1: Case Study Activity

While the United Nations Development Report (2004, p. xii) advocates that the 'critical starting point for achieving gender balance in the ICT sector is tertiary level education', work by Clayton, Cranston, Crook, Egea, Lynch, Orchard, Robinson and Turner (1993) has provided a broader framework which identifies three stages where it is possible to influence the participation by females in computing courses and the computing profession. The first stage of the framework is the *Pre-tertiary* stage where the focus is on intervention programmes for primary and secondary girls. The *Tertiary* stage has a focus on decreasing the attrition rates for tertiary female students. The final stage of *Post-tertiary* is aimed at women in the workforce or returning to the workforce.

University and industry involvement commenced with a focus on only one of Clayton et al.'s three stages, but with a growing awareness of the magnitude of the issues the programmes evolved to incorporate interventions at more stages. Eight of the case studies conducted projects at all three

stages, five conducted intervention projects at two stages, with only one University's focus remaining on just one stage (see Table 2). It is interesting to note that all groups conducted activities at the pre-tertiary stage. Some programmes concentrated their efforts equally across all stages whereas some focused their activities more at a particular stage The stage at which the majority of the activities were focused is regarded as the major focus of the programme. A minor focus refers to less activities being directed at that target audience.

	Uni1	Uni2	Uni3	Uni4	Uni5	Uni6	Uni7	Uni8	Gov1	Gov2	Gov3	Ind1	Ind2	Ind3
Pre	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tertiary	✓	✓	✓	✓	✓	✓				✓	✓		✓	✓
Post		✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓

Table 2: Focus of Intervention Programmes

✓	Major Focus
✓	Minor Activity
	No Activity

5.2 The Programme Achievements

Some of the intervention programmes were still relatively new (3 years old), and some had been operating for a lengthy period of time (up to 20 years). Examples of the extent and variety of the achievements by these 14 case study entities are described in the following section. An indication of the number of participants at various events is also provided.

In total more than 40 separate Girls in Computing Days or Role Model events were conducted with 14,000 girls, 500 educators, 200 parents and 200 role models participating in these events. More than 200 girls from nine locations throughout one state participated in one multimedia workshops. At least four separate computer camps were conducted for secondary girls; and more than 150 computer clubs now run in schools including one which is being conducted wholly online.

Outcomes of many intervention programmes included the creation of resources such as; a 'How to' kit for Girls and ICTs role models events; A 'Practical Ideas' booklet for Teachers regarding Girls and ICTs which was distributed to all schools within one state; and 'Mentoring as a Career Guidance Activity' resource kit. Other resources produced included six videos, 12 separate websites including one which contained more than 70 pages and had received more then 34,700 hits over a two year period.

For industry women there were five national women in computing conferences conducted as well as two state-based women in computing workshops. More than 20 professional development (PD) sessions were delivered to more than 400 teachers.

Scholarship/awards/bursary schemes now exist where they did not before.

Media exposure and publicity has been generated with 'Girls and ICT' articles appearing in numerous school and parent magazines, teacher journals as well as in local and national newspapers. Further, an awareness-raising campaign directly reached 23,044 students in 370 schools across one state, and indirectly reached thousands more.

There were additional projects and achievements, which are too numerous to list, that were more local and specific. Some examples include four girls taking up or intending to take up ICT careers as a result of participating in one particular event; all eleven Year 10 students at one school who participated in intervention events indicated that they intended to take at least one science and/or IT subject in Year 11; 30 students and seven teachers from six secondary schools attended a breakfast with ten female ICT mentors from a local Council.

There are also achievements that are harder to quantify. For example in a number of schools it was noted that there appeared to be an increase in ICT skills and confidence by girls in using ICTs amongst participating girls. Girls were also more willing to take a leadership role in the use of ICTs. In some

schools there was an increase in understanding of the many possibilities and options in ICT study paths and careers. Students also felt they were 'cared about', a sense of 'belonging' assisting with their retention in courses. In universities an improved curriculum and/or an improved learning environment was developed and numerous supportive communities were created enabling networking and mentoring programmes to be conducted. For industry women better networks between entities and therefore better distribution of key information occurred. Workplace strategies have been shared and professional development activities carried out.

As can be seen from these examples, these intervention programmes resulted in considerable achievements with many activities conducted and large numbers of participants involved. Can these programmes therefore be considered successful?

5.3 Criteria used to measure success

Credible evidence, be it qualitative or quantitative or both, should be gathered to evaluate the success of a programme. While formal evaluation was not undertaken of many of the activities within the programmes the evidence upon which the champions evaluated the programmes is summarised in Table 3. Similar activities have been grouped together and duplicate criteria have been removed.

Award Programme / Scholarships / Bursaries / Competitions / Grant Scheme
▪ Number of entries/applicants received and geographical spread of the entries/applications ▪ Percentage of awards going to women and growth of scholarship/award programme ▪ Willingness of organisations to sponsor awards ▪ Feedback (written and verbal) from recipients; Coverage received by the media ▪ Follow up of outcomes for winners of each category and status reports/feedback from grant recipients
Bridging Course
▪ Number of applicants; the retention rate of participants; the progression rates of participants
Creating Teacher and Parental Awareness / Professional Development of Teachers
▪ Number of articles published in literature aimed at teachers/parents and the circulation of materials amongst teachers at the secondary school ▪ Number of PD sessions organised; number of teachers attending; interest shown during the sessions ▪ Number new initiatives being conducted within schools by prevision attendees of PD
Computer Club
▪ Change in participant's attitude, skills, confidence awareness and enthusiasm through ongoing participation ▪ Engagement of participants; teacher/facilitators observations.
Girls in Computing Days / Role Model Events/ Profiling Successful Women / Speaking at Schools
▪ Numbers of participants (students, educators, parents, role models) at the events and number of registrations well before the event; Student behaviour and concentration during sessions; enjoyment and engagement ▪ Number of 'good' questions asked by students and feedback (written and verbal) from students, educators, parents, facilitators, role models and changes in attitude and awareness amongst participants. ▪ Quality of the role models; innovative activities, high energy, high impact and the how well secondary students relate to the visiting students /speakers/role models ▪ How well known 'the brand' is within the education sector ▪ Generating a sustainable model/that the event continues to be conducted annually. Illustrated also through enquiries from schools about the next event ▪ Number of interviews and publicity generated ▪ Financial support (sponsorship) from industry ▪ Creating relationships between groups: industry, education and government and forming networks ▪ Students going on to enrol in specialist ICT subjects in later years of schooling and going on to apply for scholarships ▪ Inspiring girls to set up their own computer club

Improving the Curriculum
▪ Gender analysis of students' results in relevant subjects; retention rate of girls
Mentoring / Support Community / Networking
▪ Number of participants/members in the community; membership growth and participation numbers at events conducted; the level of engagement of participants ▪ Level of activity by the community: Number of activities; scope and range of activities. ▪ Anecdotal feedback and informal comments from participants ▪ The amount of time girls used the extra hardware provided. The number of participants who sought references from participating staff members or other support and who kept in touch after graduation ▪ Programme/group becomes embedded and participant/student driven ▪ Visibility of the group ▪ Number of students/participants who 'opt out' ▪ Level of activity on discussion board ▪ Amount of sponsorship received and organisations taking part ▪ A champion emerges from the group
Overall Pre-tertiary Initiatives
▪ Increase in the percentage of girls amongst enrolling tertiary computing students.
Public Speaking Programme
▪ Students encouraging others to participate and perceived change in students' confidence levels
Residential Summer School
▪ Change in awareness of the tasks required by a 'typical computing professional' and change in interest in studying ICT and interest in a career in ICT. This leading to students choosing to enrol in tertiary ICT courses; the number who went to Uni X. ▪ Anecdotal feedback from students, facilitators and staff, during the camp and afterwards. ▪ Students returning to their school and speaking about the camp ▪ Peer evaluation from team members and other colleagues ▪ Extensive coverage in the media
Web sites/Video/Resources
▪ Number of web site hits; Growth of the website ▪ Another department/organisation using the video/resources. Circulation of materials amongst teachers at the secondary school ▪ Others recommending the resources.
Women-only workshop / Conferences on Women in Computing
▪ Answers to 'What did you like about today? What changes would you suggest for the next event?' ▪ Number of participants; Engagement of participants during the day ▪ Whether all sectors (education, industry, government) were represented
Tertiary Orientation Camp
▪ Student comments during and after the camp; Interaction of students when back at University ▪ Participants reported gaining a sense of 'belonging'; retention rates in the courses.
Other
▪ Number of referred papers ▪ Change in the culture of the organisation including a ommitment by the organisation demonstrated by a budget line entry and support within the organisation ▪ Uptake of recommendations from gender audit ▪ Becoming known as the university of choice for girls wanting to do a computer course ▪ Equity awards received

Table 3: Evaluation Criteria

5.4 Defining a Successful Programme

When is an intervention programme a success? How can we measure this? For the staff involved with the intervention programmes at Uni5 success for their intervention programme was defined as passing the subject Computing 101 for the girls who participated in the activities (Uni5_documents). Megan (Uni1) on the other hand suggested that success would need to be broader than one subject and would look like 'maintenance of numbers in my courses'. For Lesley (Ind2) success required the girls to actively follow up the opportunities that they were made aware of during the role model events:

> *That they have accessed some of the resources that were indicated from that event, that they have linked up with mentors, that they have done something about joining a computer club or at school the next year, signing up for enrolments in courses, or that they have taken back to their school, this kind of information. That they have encouraged other girls to do things or starting their own club at school, that they have just taken it further and influenced other people in what they have done as well. Because there is a sphere of influence when something can be really significant, not just the 30 girls that are there on the day, it is that whole explosive chart. If 10 of those girls get really affected by the day, and they go and impact other people, it is that classic nuclear explosion outwards. (Lesley_Ind2)*

Kerrie (Uni7) suggested that success would be that the girls who attended the summer school would take up 'careers around technology'. Similarly Jodie (Uni6) suggested that programmes were a success if they changed attitudes:

> *To see the kids taking the appropriate subjects in senior school to broaden their horizons and then, maybe the icing on the cake, would be to see them into a university or a TAFE college to do IT and then the tip would be to see them here. Jo and I don't get up there and say Uni6 is good. We don't need to. That is implicit in the whole programme. (Jodie_Uni6)*

For one of the intervention programmes still in its early stages, success focused on the implementation of the programme:

> *Success will look like having an active web presence, having some sort of mentoring support group within the faculty of ICT that the girls are running, that they are active. Even if it is only four lunches a year, it is something. Having guest speakers, that sort of thing. … Success will be the group running, success will be having organised and built up a relationship with some feeder schools. (Sarah_Uni3)*

Gov1 defined success by quantitative results; within a short period of time 30% of state primary schools and 70% of state secondary schools will have participated in Girls' and ICT initiatives. Additionally 35% of state secondary school students enrolled in ICT subjects would be female (Gov1_documents). For Debbie (Gov3) success revolved around all three stages of Clayton's framework; participation, retention and the advancement of women in ICT:

> *For me as a group I am hoping that we achieve a couple of things. One is that we really do get more women into ICT. There are three areas that we are focussed on. I hope that we actually bring more in at an earlier stage into the industry. I hope we can show that we are actually retaining more women and not losing them. Most importantly the reason to retain them is for them to actually progress through the industry so that we actually get more senior women managers, we get more people into positions of leadership that then can make a difference rather than being seen as not in areas of authority or influence. (Debbie_Gov3)*

5.5 Were these Programmes Successful?

From the perspective of the programme champion each of the programmes implemented by the case study entities was seen as a success. All the interviewees, when asked whether they considered their programmes a success, said 'Yes' though a number of the respondents then qualified their answer;

I think all the events were successful, it depends how you are measuring the success. (Clair_Gov1)

Yes. We tried to measure it quantitatively and we couldn't. We couldn't relate anything really to the programme but our qualitative work tells us that women students perceived that the programme was just great and that is enough for me. (Alison_Uni5)

Almost all of the respondents talked about individual instances of having made a difference in one persons' life and that this was enough to make the programme a success;

Yes. I know that I personally have touched lots of women's lives from that point of view. That satisfies me but does it really justify the amount of time and effort that I have put into it? I don't care. Really you cannot always measure things by the direct and tangible benefits so to me if we supported an activity and it made the difference between no girls going into a course and one girl going in I would be quite satisfied with it…(Stacey_Ind3)

While nobody described any of the projects or programmes as failures or unsuccessful, not all responses were completely positive:

There is no doubt that the success of the intervention programme depended largely on the personalities and qualities of the senior women students. Naturally some were better at the task than others. (Uni5_documents)

Partial only. I doubt if I move on that it will last independently. The paradox of the majority gender taking no ownership of the issue persists in this Faculty. We have not been able to affect staff perceptions. (Sarah_Uni3)

It was successful to a certain extent I think but only in a limited way, as far as we know. There was some form of evaluation done but there was so many confounding variables that it really didn't show a clear influence in decisions made by the girls. (Kerrie_Uni7)

6 DISCUSSION/CONCLUSION

Currently there exist a wide range of programmes that have the potential to increase the participation of females in computing and there is some evidence that these programmes have worked locally. This paper describes a research project which examined fourteen intervention programmes in detail. These programmes were conducted by government departments, industry groups or university departments throughout Australia.

The results indicate that it is clear that one type of programme does not suit all situations and that the characteristics of programmes differ widely. The target audience varied from students, at all levels of education, to women in the workforce or returning to the workforce. Different levels of resources and support were accessible for each of the programmes. While the study showed that programmes differed in various ways some common issues and characteristics emerged:

- Difficulties in measuring intangible and qualitative benefits such as increased confidence
- A focus on implementing programmes
- A lack of focus on planning and evaluation of the programmes
- The dependence on the programme champions including personalities, time available, etc
- The need for management support and buy-in from others in the host organisation was seen as critical for programmes.

There were some identifiable explicit measures of success expressed by programme leaders. These include:

- Participants actively following up the opportunities that they were made aware of during programme activities.

- Participants taking up a career in computing. This included concepts of retaining women in computing careers and getting more women into leadership roles in the computing industry.
- The degree to which management and staff of organisations hosting intervention programmes provide mentoring and support both within the programmes and afterwards.

Most of these measures had not been quantified by the programme champions. This appeared to be due to a lack of initial planning of goals and evaluation criteria but resourcing issues also seemed to play a part. A programme was considered successful by all of the programme leaders if it had made a difference, no matter how small, and even if it was only in specific areas or for small groups of individuals.

The study indicates that intervention programmes currently have some identified measures of success depending on the type of programme and the participants. Although these measures were largely self-reported, they are key to understanding the success of the programmes.

The analysis of the findings indicates that for intervention programmes to be successful they need to be structured, targeted and well planned. They also need to have clearly defined goals and evaluation criteria that can be used to assess the programme at various milestones. The evaluation criteria should be considered in the early stages of the planning of the programme and not just after the programme has been completed. Further work is required to understand how intervention programmes can be better designed and evaluated so that they can be successful and have greater impact.

Ultimately, for intervention programmes to be considered successful, given that the purpose of the programmes is to increase participation, then the participation rate of women in computing education and the computing industry needs to rise. For the knowledge-based society of the future this is necessary in order to reflect the diversity of perspectives across the whole of society and to ensure that the development of computing and information systems is based on the broadest range of solutions available. The current lack of multiple viewpoints in computing and IT development and the loss of available knowledge from women, and potential women, in the computing industry can only be considered to be a loss for society as a whole.

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