Research paper

Making co-op work for you: A comparative exploration of student attitudes to co-op programs in the United States and the United Kingdom

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Abstract

University engineering and computing courses have a long tradition of co-operative education that plays a vital role in developing students' applied skills and giving confidence to students and potential employers. Nevertheless, not all students choose to participate in a co-op course. Our study was designed to explore the reasons why students did not participate in the co-op program and what perceptions participants have about the program. We also consider students' backgrounds that may play a role in their choice. Participants were in one of three groups: A) co-op participants, B) interested applicants and non-applicants, and C) those were not interested and/or did not apply. A mixed methods approach was used, including quantitative and qualitative analysis of surveys and interviews, to compare and contrast experiences, approaches, motivations and attitudes of student groups in the United States and the United Kingdom. Results show that US and UK students who identified as disinterested in the program share similar perceptions, including the perceived cost of additional time to graduation. Students also express concern that taking time away from campus to complete a co-op affects social interactions with their peers. However, it was found that students' experiences in computing and engineering differ depending on the routes of their course of study. The overall aim was to uncover ways to increase participation in co-op education to the benefit of engineering and computing students: making co-op work.

Keywords— Cooperative education, Perceptions, Pathways, Computing, Engineering

Introduction

In the US and the UK, there has been considerable interest in graduate employability amongst engineering and computing students, and an acknowledgement of the value to students of spending periods in the workplace while they study to ensure that their prospects on graduation are good. Since the creation of the first cooperative (co-op) education program in the US at the University of Cincinnati in 1906, programs have been affording students the opportunity to gain industry experience before graduation. The University of Cincinnati program would serve as one of the most widely accepted innovative teaching and instruction techniques in engineering education (Grayson, 1993; Wankat, Felder, Smith, & Oreovicz, 2002). Co-op programs represent a rich implementation of an experiential learning approach (Kolb & Fry, 1974).

In the UK, universities have similarly provided students with opportunities to gain industrial experience through programs featuring periods when students put their skills into practice in the workplace. Unlike the US model with alternative semesters, UK models typically have just one period when the student goes into industry, with this 'placement' period lasting as long as one calendar year. As in the US, the driver for UK co-op programs has been to produce industry-ready graduates. Computing Science (CS) in the UK has seen a particular need for approaches that support student transition into the workplace, with data suggesting that a higher percentage of computing graduates are unemployed than the overall average. In the UK 13% of CS graduates are unemployed after 6 months, compared with engineering 9% and mathematics 9%, while the overall figure for all subjects is 8% (HESA, 2014). Undertaking a co-op program has been found to enhance employability (for example Brooks, 2012; Blasko et al., 2002). However, a recent report in the UK highlighted the dwindling number of computing students undertaking a year-long placement, down from 30% to 26% (Docherty et al., 2015). While less is known about the numbers taking shorter placements, the decline of co-op programs in the context of continuing incidence of CS graduate unemployment is a cause for concern.

Although the structure of co-op programs is similar, institutions have different policies regarding eligibility requirements. Furthermore, employers may also place requirements on the students they accept. It is important to understand the factors that affect co-op participation, because there are several complicating factors, including student attributes and differing program requirements. Students consider benefits and drawbacks when choosing to participate in a

cooperative education program. With co-op education of importance in both the US and UK, the study was designed to explore these factors in two different institutions.

Literature Review

Student co-op education offers work based learning opportunities and has been found to be an effective way to provide relevant employment skills, experience and awareness of employer culture. The evidence that co-op is valuable to students both in terms of employability and academic achievement is strong (for example, Docherty et al., 2014; Green, 2011; Driffield et al., 2011; Patel et al., 2012). Students experience benefits to academic performance, learning outcomes, and subjective well-being (Blair, Millea, & Hammer, 2004; Parsons, Caylor, & Simmons, 2005). Students who completed a three-term co-op program had higher GPA than their non-participant counterparts (Blair, et al., 2004). Academic performance, post-graduate salary, and time-to-graduation are all significant outcomes of co-op participation. Completing the three-term co-op increased students' time-to-graduation by two terms (Blair, et al., 2004).

Research suggests that co-op enhances student skills, knowledge, competence and experience (Bates, 2008; Green, 2011; Purdie et al., 2013). Student motivations for taking a placement include to improve job prospects, support their career decisions and to earn money (Smith et al., 2015). Aside from quantitative measures, co-op participation may affect learning and subjective well-being. Students who exhibit proactive behavior during their first co-op term experience significant impact on learning outcomes (Parsons, et al., 2005). Early socialization experiences, including social and content aspects, positively affect students' non-technical skills (Noyes, Gordon, & Ludlum, 2011; Parsons, et al., 2005). Placement students are at a distinct advantage over non-placed students when applying for work after graduation (Brooks & Youngson, 2014). Additionally, co-op students report greater certainty about career choice (increased career identity) and are more likely to obtain a job related to their major at graduation (Raelin et al., 2014). These are all positive reasons for students to apply. Less is known about the reasons behind students who are eligible but not applying and the factors that students believe act as barriers to successful applications. Employers benefit from student placement too and cite other advantages including bringing new skills into an organization and having a specific task completed (Smith et al., 2015).

However, the uptake in co-op programs varies. Docherty (2014) states that students are less geographically mobile than they were 20 years ago and are often unable to take placements

that are too far away from their abode. He further suggests that students are reluctant to move away from their cohort, and they may need to maintain their paid employment and thus cannot risk a placement.

In a study of higher education institutions in the UK, Banga & Lancaster (2013) found that placement staff cite a lack of motivation as the most significant factor (23% of respondents) in students not applying for placement, followed by students not feeling prepared to apply (21%) and lacking confidence/ fear of rejection (21%).

Based on the literature review, the following research questions emerged:

1) What reasons do students have for not applying for a co-op program?
2) What factors lie behind students applying or registering interest but then not taking part in a co-op program?
3) What are the pathways to participate in co-op?

Background

The paper includes a large Midwestern research university in the US. That co-op program offers 5-session and 3-session plans. Formally initiated in 1954, the program now serves over 1,100 students and more than 300 active employers from private industry and government agencies. The program is currently available to the students in the colleges of Agriculture, Engineering, Health and Human Sciences, Liberal Arts, Management, Pharmacy, Science, Technology. The College of Engineering has the highest rate of student involvement with 539 new applicants, 246 new placements, and 645 active participants during the 2013-2014 academic year. There are several preparatory activities, including career fairs, interview days, and informational sessions. Additionally, there are several recruiting efforts ranging from freshman orientation, classroom visits, and a student-led organization that spreads awareness of the program.

The program offers voluntary plans for students who finish their first or second year at the institution and are in the upper half of their class. Faculty Coordinators screen potential employers to assure quality job assignments and refer interested students for job interviews - typically in the spring. Once a co-op job is accepted, students alternate sessions of academic study with sessions of work with a qualified employer. Students are expected to stay with the

same company throughout their rotations. Although students do not receive academic credit for participating in co-op, they do receive a certificate of completion.

The second university in this study is in the UK and has a large undergraduate student population. It has a mature co-op program where students undertake a year-long paid placement in industry while also earning academic credit equivalent to six months study. Students completing the co-op program therefore graduate 6 months after the non-co-op students. The university places approximately 40 students every year which normally constitutes about a third of the eligible student cohort. The co-op application process is competitive and not all students are successful. In addition the university leads a Scotland-wide paid placement project, e-Placement Scotland, designed to work with employers to create placement opportunities and advertise them across all Scottish universities and colleges (Smith et al., 2013). These placements are most commonly 3 month summer placements and do not in themselves attract academic credit, but can be taken by students at universities that have a co-op program as part of that program. The project team arranges for presentations at each university with a view to promoting placements and explaining the application process. Project resources include an application website, CV advice and interview preparation techniques. The university itself encourages students to apply for placement and take part in pre-placement activity including CV workshops, mock interviews, and mock assessment centres.

These universities are therefore well-positioned to investigate the factors associated with student decisions to pursue – or not to pursue – a co-op program, and to explore whether the factors affecting uptake are convergent or divergent across different co-op contexts.

Methodology

A mixed methods approach was taken using both quantitative and qualitative methods. A questionnaire was designed in the US and then adapted for the UK, based on the findings of the literature review, to ask students about their placement experiences. Three groups of students were identified at each institution, including co-op participants, interested applicants and non-applicants, and those were not interested and/or did not apply.

United States

The survey instrument was developed using input from the co-op program coordinators. It was emailed to 1,938 students who completed the second course of the foundational

engineering sequence, consisting of 136 co-op participants and 1,802 non-participants. Generally, students were part of the sophomore class and would have been eligible to apply for co-op Spring 2014. The rationale for this population is that they would be the most recent cohort of co-op students who have completed one rotation. This population also contains students who are still eligible to apply for the program Spring 2015. Of those, 286 students responded to the survey.

The survey consisted of closed- and open-ended responses, including questions about perceptions of co-op, process of obtaining a placement, and demographic information. In the US three groups of participants were identified:

- (Group A) Successfully obtained a placement: students were then asked about their experiences and perceptions of the program and how they obtained their placement;

- (Group 1B) Express interested in the program, but did not necessarily apply: students were asked why they were interested and whether they had started and/or completed an application;

- (Group 1C) Not interested in the program: students were asked why they were not interested and other activities in which they were interested.

Quantitative analysis included descriptive and bivariate statistics of survey questions were used. On the qualitative side, open-ended responses were coded to analyze perceived benefits and drawbacks of the program.

United Kingdom

In the UK three groups of participants were identified:

- (Group A) Applied successfully for a placement: students were then asked about the recruitment process and how they had prepared for the recruitment process;

- (Group 2B) Applied but had not yet been successful in securing a placement: students were asked about the number of placement jobs they had applied for and the nature of their applications to date;

- (Group 2C) No applications made: students were then asked whether they had been actively engaged in the preparation activity and the reasons why they had not applied.

Three separate questionnaires were used, based on the situation of each student interviewed. As with the US, the questionnaire mixed factual questions about age, country of

domicile and ethnicity combined with open questions about their experiences of placement. Placement data was uploaded to NOVI for analysis.

Results and Discussion

United States

Student Categories. Three groups of students were identified based on their survey responses. Group A includes students who identify as current co-op participants. Group 1B consists of students who are not co-ops, but interested in the program. Students in Group 1B may or may not have applied for placement. Finally, Group 1C consists of students who expressed no interest in the program.

Table **1** shows the number of students in each group and the percentage of the total number of respondents per group listed in descending frequency.

Table 1. Frequencies of US students in each category

Group Description	Frequency	Percentage of total (n=286)
Not interested (1C)	137	47.9%
Interested, but non-participant (1B)	59	20.6%
Current co-op participant (A)	58	20.3%

* Remainder of students did not know about the program or preferred not to answer

The composition of survey respondents was disaggregated by US citizenship, gender, and race/ethnicity. Approximately 30% of respondents were female, while the engineering population proportion is usually ~ 20%. Underrepresented minorities, including women, Black, and Hispanic students, had the lowest response rates. Of those surveyed, there were varying proportions of co-op participants by engineering major discipline. The proportion of Electrical and Computer Engineering participants versus non-participants was among the lowest.

Pathways into Co-op and Student Perceptions. Based on student answers and survey logic, five phases reflecting different pathways into co-op emerged – 1) interest; 2) information; 3) application; 4) interview; 5) participation. Figure 1 at the end of the paper illustrates the variety of pathways students may take. Not all students surveyed were aware of the program; 91.3% of survey respondents were aware of co-op. Of the students who knew about the program, more than half indicated they were not interested in co-op (Group 1C) and they do not enter the pathway model.

The information phase shows that 78% of co-ops attended an informational session, while only 48% of non-participants who expressed interest attended one of the sessions. We do not have that information for students not interested in the program, but will capture that data in follow-up interviews.

Open-ended responses from co-op participants and those who are not interested in the program are summarized in the tables below. Table 2 lists perceived advantages in ranking order (1 being the most common) and Table 3 lists the perceived disadvantages. Co-op students view career exploration as a benefit to co-op, while non-co-op students say that they are not interested in co-op because they want to explore and fear committing to one company/industry, thinking that summer internships will better fill this need. Both types of students have the same desire surrounding career exploration but differ in their views of how co-op fits this role. There are opportunity areas here for co-op programs in communicating the role co-op can play in exploring career options.

Table 2. Perceived advantages by US co-ops

Group A: Co-op participants	1. Work Experience 2. Money 3. Competitive edge in the job market 4. Job training 5. Networking 6. Career exploration

Table 3. Perceived disadvantages by US co-ops and non-participants

Group A: Co-op participants	1. Disconnect with peers on campus 2. Time to Graduation 3. Missed Opportunities on Campus 4. Off schedule in classes
Groups 1B and 1C: Non-participants	1. Time to Graduation 2. Prefer Internship over Co-op 3. Missed Opportunities on Campus 4. Commitment to 1 company/industry

Discussion. The US survey respondents revealed that there are several pathways into co-op. While those pathways differ among co-op participants, they also differ for those who ultimately do not participate in the program. There is a large group of students who were not interested in the program, citing time to graduation and a preference to do a summer internship instead of co-op. Some of the top advantages perceive by co-op students are work experience, money, and wanting to be competitive in the job market after they graduate. Those same students cited a disconnection with peers on campus and time to graduation as the top drawbacks of the program. In summary, there are three main findings from the US survey:

1) There are a variety of pathways to co-op; however, students may exit the process at different points along the pathways.

2) Co-op students prioritize advantages and disadvantages of the program differently than students who are not co-ops.

3) Some perceived advantages of co-op are viewed as disadvantages by students who do not participate in the program.

The study is limited by a single US institution with a unique co-program. Policies may differ by institution and even discipline. Self-selection bias is another limitation to consider since students elect to take the survey independently. Follow-up interviews with survey respondents are currently underway and will provide a deeper understanding of student motivations and attitudes toward co-op. Future work will also address institutional differences by examining specific program policies and trends. These results will be compared with prior academic performance and employer interactions.

United Kingdom

During three separate interview sessions, all second year students attending computing classes were invited to participate. In total, 71 interviews were conducted (n=71). This constituted 58% of the entire cohort of students eligible to apply for co-op. The structured interviews followed a survey based on the US online survey with adjustments to account for specific pre-application activity and interactions with support teams. Of those interviewed 19 had secured a co-op, 18 had applied but had not yet secured a co-op and 34 students had not applied for any placements. The characteristics of the three categories of students are given in Table 4.

Table 4. UK student characteristics in each of the three categories

Characteristic/ % of total	Successful	Not placed yet	Not applying

population			
Female	16%	11%	9%
Male	84%	89%	91%
Age 17-22	53%	50%	76%
Age 23-28	31%	17%	15%
Age 29-34	10%	17%	6%
Age 34 - 40	5%	17%	3%

Students were initially asked whether they had been aware of the possibility of co-op before applying for the course. Of those that had applied successfully 53% had been aware, of those applying but not yet successful 56% had been aware. Of those that were not applying for co-op 71% had been aware of co-op opportunities. The data collected from each of the three categories is now explored.

Group A - Applied successfully. This participant group, who had applied and secured a co-op, is of interest in this study as a means of comparing their responses with the other two groups. On average students had applied for 4 placements. Table 5 shows their co-op intention.

Table 5. Group A - UK student responses reflecting their co-op preference

Statement	Strongly agree/ agree	Neither agree nor disagree	Strongly disagree/ disagree
I wanted to do co-op as part of my course	79%	21%	0%

Participants were asked about their level of engagement with the co-op preparation activity and 90% of students had attended co-op presentations and the co-op academy program. Students were asked if they thought there were any drawbacks to going on the one year co-op and 17% said that graduating later was a drawback and 11% said that they would be out of synch with existing classmates.

Group 2B - Applied but not yet successful in securing a co-op. Students had on average applied for 6.5 co-op positions and 63% had been for interview. Group 2B were asked whether they had wanted to do a co-op as part of their program and Table 6 summarizes their results.

Table 6. Group 2B - UK student response reflecting their co-op preference

Statement	Strongly agree/ agree	Neither agree nor disagree	Strongly disagree/ disagree
I wanted to do co-op as part of my course	94%	0%	6%

Participants were asked if they had taken part in co-op preparation activity and 83% of students had been involved. Asked about their motivations to apply for co-op all students cited good experience and 83% mentioned future job prospects as a reason to apply.

Group 2C - No applications made. This group of students was also asked if they had originally wanted to do a co-op as part of their course. The responses are given in Table 7.

Table 7. Group 2C - UK student responses reflecting their co-op preference

Statement	Strongly agree/ agree	Neither agree nor disagree	Strongly disagree/ disagree
I wanted to do co-op as part of my course	41%	35%	24%

Of this group 38% had taken part in co-op preparation activity. When asked whether anything more could be done to help them be successful 35% mentioned advice related to the application process and 25% mentioned mock interviews. The participants were then asked specifically why they had not applied for co-op and their responses are given in Table 8. Students were able to select multiple reasons.

Table 8. Group 2C - UK student responses for not applying

Reason for not applying for co-op	Percentage citing this reason
Prefer to concentrate on degree	44%
Length of time taken to complete the course	29%
Co-op roles advertised not relevant to course	23%
Location of co-op unsuitable	12%
Did not know about co-op	12%
Not interested	12%
Unsure how to apply	9%
Value social interactions at university	9%
Financial reasons	6%

Student were invited to provide further explanation and students mentioned the following: worried about the level of knowledge that was expected of them, not yet ready and confident about applying and some students had just arrived at university as direct entrants to the course and felt they had just become accustomed to the course.

To reflect further on why the students had decided against applying we asked if students could see any drawbacks in undertaking a co-op. Students cited length of time taken to complete the course (35%); 26% saw no drawbacks and 15% felt they would miss out on teaching. When asked, in the future, what type of co-op would suit them best, 82% of students stated that they would prefer a 3 month summer co-op.

Discussion. Students in all three groups had participated in the co-op preparation activity and in all three groups over 40% of students had wanted to do a co-op as part of their course. The group who expressed the biggest commitment to doing a co-op were group 2B who had been applying without success (94%).

This study shows that timing of the co-op on a course is critical to student uptake. This echoes findings in the US (Ramirez et al., 2014). It is clear from student responses that the one year co-op following on from two years of study was a good model for students: they had consolidated knowledge and were more confident in their approaches to co-op. Direct entry students who had joined the university part way through the course after studying elsewhere either felt they were not yet ready or were concerned about leaving the course just as they had settled in to a study routine. The findings contradict the perceptions of co-op staff that students are not motivated, as reported by Banga & Lancaster (2013). Instead there was anxiety about leaving the course and seeing co-op as a distraction from concentrating on their studies with only 12% saying they were not interested in a co-op. In all groups there was a good level of engagement with the co-op preparation activity (90% for placed students, 83% for those applying and 68% for those that were not applying). This preparation work included CV workshops, presentations from former placed students and mock interviews. Even students not applying found the activities useful and insightful.

The main limitation of the study is the focus on two single institutions; however this was useful in terms of exploring the attitudes to the co-op preparation interventions. A further study exploring student attitudes across institutions and different geographical locations would be useful in establishing more general claims for increasing co-op uptake.

Conclusion

This paper was designed to explore student attitudes toward co-op, focusing on the reasons why students did not take a co-op program. Survey respondents fell into three groups: those who had successfully applied; those who registered an interest and applied for co-op but had not managed to secure a co-op; and finally those who did not apply for co-op and/or did not register an interest in the program. The study revealed that UK participants in all three groups engaged to some extent in preparation activity designed to increase uptake of co-op, similarly US students who were interested in co-op or current co-op participants attended informational sessions. The study revealed that both UK and US students who had not applied for co-op had

encountered both real and perceived barriers that included a preference to concentrate on their degree studies and, for the one year co-op, the length of time taken to complete the course. The experiences of students who registered an interest varied. Some students had not undertaken the extensive preparation required for often quite complex and demanding application processes, while others were unsuccessful through the selection process due to competition for co-op roles. There are several comparisons between the US and UK programs:

- Co-op presentations and informational sessions serve as gateways to participation.
- Students in the US and the UK shared concerns about the length of time taken to complete their programs.
- In the US missing opportunities on campus was important to students, while in the UK there was concern about missing taught classes.

By capturing student perspectives, the studies uncover ways to increase participation in co-op education to the benefit of computing and engineering students. Two key elements are defined which can play an important role in increasing participation; communication of the benefits of situationally appropriate co-op and models may emerge to reconsider the timing of co-op opportunities; contextual pre-application preparation to ensure students recognise their skills and are offered specific targeted activity. The paper shows that there is an opportunity to learn cross-cultural "best practices" to make co-op education accessible and effective. While the data underpinning these two elements comes from students in the US and the UK, the elements themselves are aimed at both students and employers. There is a future for co-op education which would see at its heart both employer and student ideals and an infrastructure to facilitate the alignment of both.

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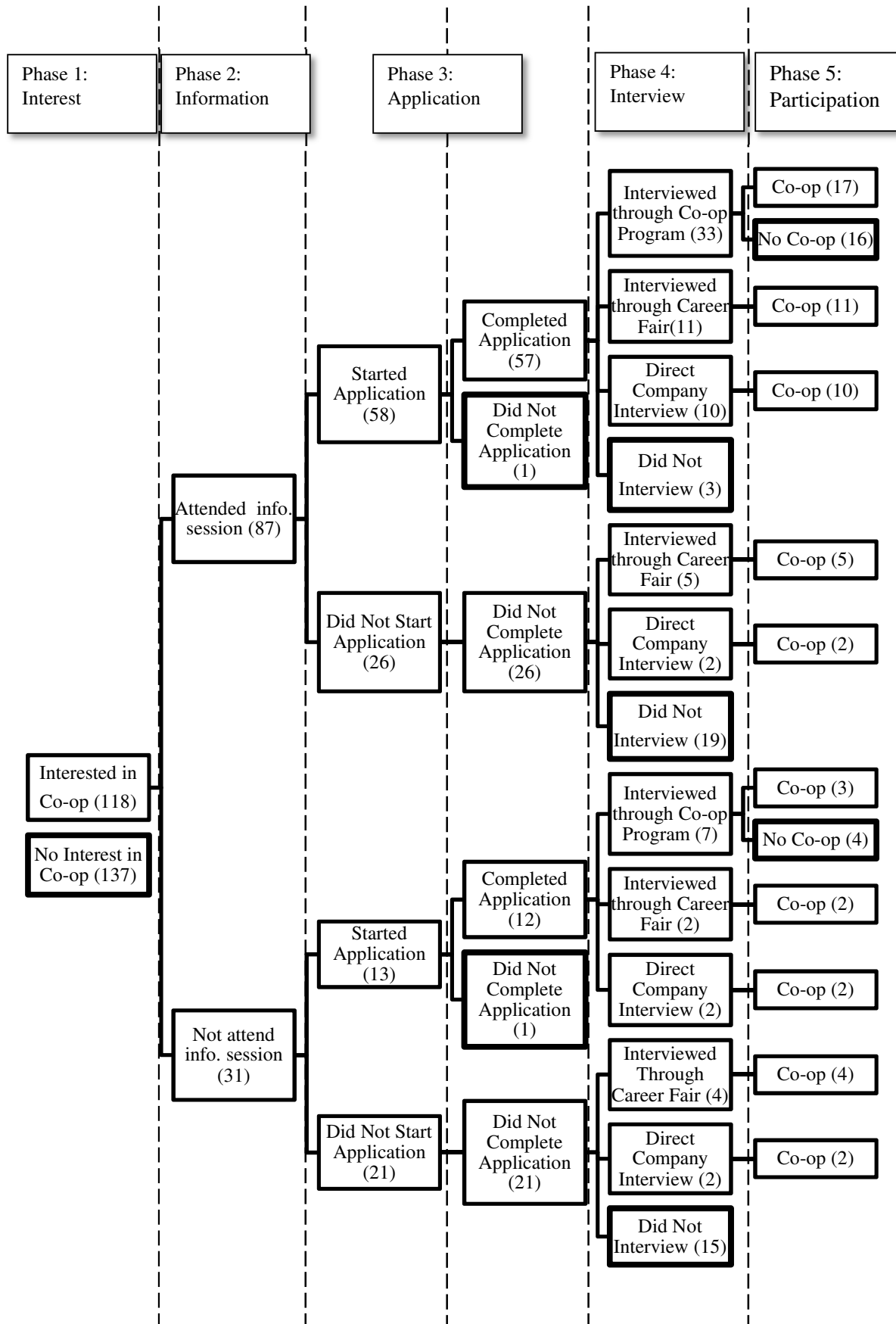
Figure 1. Pathways to co-op participation with frequencies