Design of Digital Products in the Future: A Study of Interaction Design Students and Their Perceptions on Design Issues

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Abstract. Today's students on programs covering interaction design will most likely contribute to the development of products that we will use in the future. The roles they will play in this regard will of course depend on various factors. Regardless of this, their educational background is a vital component, along with their motivation, personality, knowledge, and ideas. The present study reports on an online questionnaire (n = 82) given to students on interaction design programs. Additionally, eight qualitative interviews were performed to gain more insight. The findings show that, in general, the students of today perceive themselves to be in great shape for the development of future products. However, the majority of the respondents have also considered other study areas that might be relevant to them, grounded in shared backgrounds and interests. They also enjoy working individually with design ideas and prototypes, and they generally prefer working with digital solutions over working with print and physical products. User testing is found to be a vital element within the design process, although the analysis of such data is found to be somewhat difficult. Concerning industrial needs, the students struggle to clearly define the role of an interaction designer and the tasks they are expected to perform when taking on a job within the design industry. This paper ends with concluding remarks and suggestions for upcoming research contributions.

Keywords: Interaction design · Human–computer interaction · Usability · Online survey · Qualitative interviews

1 Introduction

The everyday use of technologies influences our lives in many ways. For instance, it influences the way we communicate, interact, collaborate, and exchange knowledge. However, there have been major changes over the last 15 years as regards to how people use technologies in different contexts (e.g. work and leisure) as a result of the emergence of personal mobile devices, agent-based technologies, and social networks [1]. We are also witnessing increasing numbers of innovations and traditional face-to-face interactions are no longer always the preferred method of communication. Additionally, we have access to a huge number of digital services and a vast amount of online information. In some cases, we also see that there are no alternatives to digital interactions and that

physical information largely no longer exists. In many cases, the user has no choice if they want to search for information and/or apply for a specific service. Instead of in-person contact, in many situations, we must fill in an online form or an electronic schedule. Consequently, we need to facilitate high-quality interactions and great user experiences on the Web [2]. During the last few decades, academics and practitioners have also shown an increasing interest in the use of information technologies due to the positive impact on management and strategies, along with how technologies influence financial performance [3]. In this regard, "The design of interfaces for business-to-customers electronic commerce has been an area of high interest to MIS HCI researchers in the last decade. This is partly due to the widespread growth of electronic communication and digital interfaces that are the sole way of interacting with pure e-tailers" [4, p. 17]. Thus, the facilitation of great user interfaces and the provision of high-quality solutions are vital in our digital society. This is especially true within the public sector, where all users should have equal access to digital information and online services [5]. Consequently, organizations are under a great deal of pressure to facilitate this access by allocating resources and investments for development and quality improvements. Websites are also the key to online information and services through the graphical user interfaces that they provide for their users [6]. For some companies, we also see that their competitors are only a mouse click and/or a Google search away. Thus, the designers of digital solutions and Web applications must have different skills relating to the needs of the users (target group), the available technologies, and design principles, along with knowledge concerning interactions that take place between users and computers/mobile devices [7]. Although the field of interaction design is growing rapidly and receiving increased attention, there is a need to conduct research on various topics within this area [8]. Moreover, the research that is undertaken also needs to produce results that can be useful for both the industry and for practitioners [9] and we need to bridge the gap between researchers and designers [10].

The present paper emphasizes the design and development of digital solutions, especially by the people that will most likely contribute to this field in the near future. We expect that many of today's students will be tomorrow's designers and will be vital contributors to products that we will have to trust and use frequently in the future. Due to the ever-growing degree of digitization within the last decade, we can assume that more organizations will increasingly need expertise in this field in the coming years. During the last decades, designers has also been forced to adapt to changing user contexts because of new technological innovations, as well as cultural and social changes in our society [11]. Moreover, it is critical to every designer and manager that Websites and other digital solutions meet their users' requirements and expectations [6]. The consequences of not doing so can be many and shared, including bad usability, frustrated users, a loss of sales, and a negative reputation among users. As a result of new innovations and novel ways of communication today, we also find that many educational institutions worldwide offer educational programs in the fields of Web design, interaction design, and the programming of Web and mobile applications. Such programs intend to meet needs within the design industry through teaching in both technology- and design-related topics. Regarding interaction design and product development, we find that user testing and evaluations, design principles, and knowledge of the interaction

design process and the design team are essential [7]. Designing products and digital solutions is usually a long process and is not always straightforward. Therefore, we need to start correctly and follow each step in the right direction. We also find many research articles, textbooks, and online resources covering interaction design-related topics that are of interest to both practitioners (the design industry) and academia (lecturers and researchers). Additionally, there are many Web forums and blogs discussing topics of interest within this field that share ideas, expertise, and exchange knowledge.

The present paper explore how students, who are up-and-coming designers, perceive the future of interaction design and the way in which we will interact with products in the future. This paper reports on an online survey questionnaire among design students (n = 82) in higher educational institutions in Norway. In addition, eight qualitative interviews were held with interaction design students enrolled in bachelor programs. Many approaches could have been taken when studying this phenomenon, but in this paper, interests in and motivation for studying interaction design, the perception and role of user testing, and students' perceptions of future products. We also note that many people working within this field discuss the role of interaction are emphasized designers (and similar roles such as UX designers, Web designers, and human–computer interaction [HCI] experts). The working tasks they are supposed to complete vary considerably within the design industry and the individual organizations [12].

The rest of the paper is organized as follows: Sect. 2 provides related work pertaining to the topic of interest. Section 3 deals with the methodology and Sect. 4 presents the findings of our study. In Sect. 5, the findings are discussed and concluding remarks are provided in Sect. 6. In addition, suggestions for forthcoming research contributions are given.

2 Related Work

The field of HCI has often focused on the interface primarily as a tool for managing a computer and/or the software, but during the last few years, it has also become a framework for exploring content such as music and videos [13]. Within the Scandinavian context, projects related to user participation and participatory design, a central part of HCI and interaction design, can be traced back to the 1970s [14]. "While there is no commonly agreed definition of interaction design, its core can be found in an orientation towards shaping design artifacts—products, services, and spaces—with particular attention paid to the qualities of the user experience" [8, p. 4]. From this, we see that to some extent, interaction design is an umbrella term, and we can expect that people working within this field have shared backgrounds and experiences. An "interaction designer" is not a protected working title, and it covers many and shared working tasks within the design industry [12]. Moreover, interaction design is a complex discipline and people working within this field range from those involved in technological development within academia to business product groups and start-up companies [10]. Findings from Churchill, Bowser, and Preece [1], investigating HCI subjects and related fields, varied among people from different language populations, and ranged from cognitive science,

design, art, and statistics, to software engineering and business. Topics within HCI that were considered as important ranged from teamwork, media criticism, and language processing, to product development, robotics, and social network analysis. The fact that this is an interdisciplinary and complex field is also reflected in the variety of educational programs on offer worldwide. According to Churchill, Bowser, and Preece [1], there are a high number of courses offered in HCI and that number has increased during the last decade. Regarding the education given within this field, Nirbrant, Hvannberg, and Lindquist [15] stated that: "It seems much of the traditional education in HCI has focused on training software developers to become generalists, who are supposed to design pleasant user experiences in addition to knowing how to design and implement software underneath" (p. 187). From this, we can see that interaction design covers many and different tasks, and needs to be specific to the individual working context and situation.

Interaction design is largely carried out by multidisciplinary teams consisting of people with knowledge of areas such as engineering, programming, design, and psychology [7]. Design team members should have diverse areas of expertise and unique knowledge concerning user experiences and the development of digital solutions. Although the design process of interactive and physical products involves a design team consisting of many people [2], the role of an interaction designer is especially vital. Working with interaction design requires great and unique knowledge of how users interact with a given solution, along with their needs and interests in conducting various tasks and searching for information in our digital society. According to Gould and Lewis [16], "The design team should be user driven. We recommend understanding potential users, versus 'identifying,' 'describing,' 'stereotyping,' and 'ascertaining' them, as respondents suggested. We recommend bringing the design team into direct contact with potential users, as opposed to hearing or reading about them through human intermediaries, or through an 'examination' of user profiles" (p. 301). When one is working with interaction, an iterative process and the development of solutions do not happen in a linear way, and sometimes there is a need to take "one step forward, two steps back" [17]. To create great Websites, designers also need to work closely with content creators, because both the aesthetics and content have been found to be essential elements when aiming for success, along with issues concerning the entire user experience [18]. Over the past few decades, designers have also needed to think about the future use of different solutions [19] to facilitate user satisfaction and usability.

However, for years, the HCI community has struggled with integrating design research practice. Design has gained a foothold in practice, but it has had less of an impact on research related to the HCI field [20]. Within the field of interaction design and HCI, we find that knowing the users and their interests and needs is vital to create great user experiences (see [21]). In this regard, usability testing is an important activity throughout the design process. The users must be involved as early as possible in system development and interface design, using various techniques, such as high- and low-level prototypes [22]. The evaluation of interactive systems is also a vital component within the field of HCI [11]. "One thing we seem to have learned over the years is that no one formula guarantees usability every time. There are no easy ways to always build a good user interface. We know that relying on a designer's intuition usually is risky. We know that evaluation of interfaces is critical" [23, p. 23]. Therefore, we need people that are

knowledgeable and have expertise within this field and in related areas (e.g. psychology and programming). To stay updated and gain increased knowledge in regards to new methods, tools, and best practices within this field, a study from Roedl and Stolterman [24] reported that practitioners actively use channels such as Twitter feeds, blogs, and online magazines, in addition to attending conferences. This evidences a growing industry that is in constant flux.

Through activities such as user testing, we can identify various challenges and problems associated with a given design, as experienced by actual users of the solution and from their point of view. The purpose of such testing is to gain knowledge of how the solution works, what works well, and what should be improved [17]. The only way to determine this is to conduct testing early in the design process to enable finding the right direction further on in the process. User testing can be quite time consuming and costly, but testing can also be carried out relatively easily and inexpensively. This largely depends on the method used, the equipment, and the type of analysis performed. In regards to user testing, we can choose between different methods [7]; for instance, the various tasks given to the participants, the observation of task performance, eye-tracking metrics, individual interviews, and focus-group interviews. In some cases, an advantage can also be found in a combination of different methods where benefits arise from the strengths of each of them. According to Bødker and Buur [25], "The wish to reframe usability practice came out of practical experiences and research findings that showed how usability issues are often brought into the design process too late with too little to say, because of the laboratory testing priority of traditional usability work" (p. 153). We need to choose the method that is most feasible and suitable for the solution and development context, the resources available, and the feedback required from the users. In every design process, we must also be aware of what a lack of usability might result in and how this will influence the users, the solution, and the service provider.

After conducting a literature review emphasizing the topic of this article, no articles were identified with the same approach, which makes this a great research opportunity.

3   Method

This paper involves a mixed-method approach [26] and draws on: (1) an online survey questionnaire among interaction design students (n = 82) in higher educational institutions in Norway. The aim was to explore how students perceive the future of interaction design. We have mainly focused on their interests in and their motivation for studying design, the role of user testing, and students' perceptions regarding future products. (2) Grounded in these findings, eight qualitative interviews with interaction design students was conducted to gain additional insight and knowledge.

3.1   Online Survey Questionnaire

A questionnaire consisting of seven background questions and 32 questions (statements), divided into four topics (interests and motivation, characteristics, user testing, and thoughts about the future of interaction design) was developed. The topics are of

special interest to the research objective. The background for the questionnaire was developed white and the color black was used for all the text. Some of the questions in the survey were positively formulated, whereas others were negatively formulated. In addition, four open-ended questions (free-text fields) were included in the survey. The five-point measurement scale ranged from "strongly disagree" to "strongly agree." The questionnaire was administered through SurveyMonkey and the data were collected through a Web-link created by the software. Before the survey was conducted among the participants, a pilot test was administered, resulting in a few modifications and changes to the questionnaire. The participants in the present study were students from two different university colleges in Norway. The data were collected in April and May of 2016, and the survey was closed after 82 useful respondents had completed the questionnaires. Before the participants filled in the questionnaire, they were introduced to the topic and the aim of the survey by the researcher. The students were informed that participation was voluntary and that they could stop at any time. The students filled in the questionnaire before or immediately after a lecture while they were sitting in the classroom. Descriptive data are provided at this stage (i.e. in this paper).

3.1.1 Participants

Table 1 shows the respondents' profiles and the background information pertaining to the respondents. Each of the questions that were asked had different answer alternatives, and the respondents only had the opportunity to provide one answer to each of the seven backgrounds questions.

Table 1. Respondents' profiles (the numbers are reported in percentages).

Questions	Answer alternatives (reported in percentages)
Education level	Bachelor 1st year: 20.73%; Bachelor 2nd year: 79.27%; Bachelor 3rd year: 0%
Gender	Male: 48.78%; Female: 51.22%
Age	19–22 years: 43.90%; 23–26 years: 30.49%; 27–30 years: 14.63%; 31–35 years: 7.32%; 36–40 years: 2.44%; Over 40 years: 1.22%
Educational background (before starting on the present study program)	No higher education: 68.29%; Bachelor level (not relevant for design): 10.98%; Bachelor level (relevant for design): 3.66%; Master level: 2.44%; Other: 14.63%
Plans in regards to further education	Yes—relevant studies: 24.39%; Yes—non-relevant studies: 1.22%; I don't know: 47.56%; No: 26.83%
Part-/full-time job, today, of relevance	Yes: 18.29%; No: 32.93%; Partly: 20.73%; I wish I had: 28.05%
Earlier part-/full-time job of relevance	Yes: 19.51%; No: 62.20%; Partly: 18.29%

Most of the respondents (in the survey) were in the second year of their education and there was a balance between the genders (male/female). The majority of the participants were in the 19–26-year-old age group and they had no higher education (before

starting on their present study program). Almost 48% did not know if they would pursue further education, whereas 25% planned to pursue further education related to design. About 27% did not have any plans for future studies. In regards to working experience, 18% currently had a job relevant to their current field of study, whereas 33% did not. Moreover, 28% did not have a relevant job but would like to have had one.

3.2 Qualitative Interviews

To gain more insight that could add to the body of knowledge, eight qualitative interviews were held with interaction design students (n = 8) attending their third year on a bachelor program. An interview guide was developed based on the findings from the online survey that was conducted and on topics of particularly interest. During the interviews and in regards to the questions asked, we chose to focus mainly on the students' perceptions on the role of an interaction designer, on the important skills required for the role, on user testing and its importance, and on interaction design in the future. Depending on what the students responded, follow-up questions were asked when needed. The interviews took place in groups consisting of 2 + 3 + 3 students (an equal gender distribution in the 22–31-year-old age group). The researcher asked questions and the students answered and discussed the topics highlighted. This paper present only excerpts of quotes from the interviews and not the interviews in full. The purpose of the interviews was to obtain information in addition to the survey data. The interviews lasted for about 30 min and notes were taken. All the participants were interested in sharing their views, thoughts, and input. The interviews took place in a quiet meeting room and all of them agreed to participate in the study. Immediately after the interview was finished, the notes were reviewed by the researcher and prepared for analysis. As previously described, the intention was to gain more in-depth knowledge grounded in the findings from the survey. Descriptive analyses have therefore been performed and are seen in light of the previous findings (as adding value to the survey findings).

3.3 Limitations of the Study

The present paper reports on data gathered among a limited number of interaction design students in Norway (representing two different university colleges). In the future, studies could paint a more comprehensive picture by extending the data collection (number of respondents) and unit of analysis. As mentioned earlier, the aim of this paper is also to discuss the feasibility of a future study and to determine what adjustments may need to be made to the questionnaire and to the use of theories, along with research gaps that need to be filled. Upcoming studies will seek to receive feedback from practitioners (within the design industry) regarding the topic of interest in this paper and compare their feedback to the present findings.

4 Findings

To communicate the findings, this section is divided into three subsections. Section 4.1 covers the students' motivations for studying interaction design, whereas Sect. 4.2 deals with the perception and role of user testing in interaction design. Section 4.3 presents the overall findings regarding the students' perceptions of future products and the role of interaction design in the coming years.

4.1 Interests in and Motivation for Studying Interaction Design

This section start out by reporting on the students' interests in and motivation for studying the field of interaction design. The findings show that the majority of the interaction design students envisioned a long career within the field, grounded in a genuine interest in design and product development. They wanted to create the best solutions for the future and felt that they would have much to contribute in the coming years. Furthermore, the majority of the students were also motivated to put effort into securing a great job after completing their education. Despite their positive attitudes and motivation in terms of studying interaction design, the majority of the respondents had also considered other studies that might be of interest to them. Learning from this, we see that interaction design covers many and various aspects and that people with an interest in this field have shared interest areas and personalities that could fit different positions and working tasks in a design project. Regarding their motivation for studying interaction design, various comments were made: "I want to help people and give them great user experiences"; "There are no other creative (educational) alternatives"; "I hope there are great opportunities for getting a job"; and "It is not design defined as 'fonts and colors' that motivates me most; this comes in the second round. I am motivated by design as a 'debate within society' and as a part of people's everyday reality." From this, we learn that interaction design covers a large field and casts its net wider than what users actually see on the screen (the interface design) and the technology behind it. The students of today want a profession in which they can be creative, contribute to society, and facilitate great user experiences through user-friendly and high-quality solutions.

Moving on to the respondents' characteristics, the majority of the respondents felt that they had qualities that were needed when working as an interaction designer: about 45% felt that they were striving to gain knowledge relevant to creating great, user-friendly solutions. This result suggests that it can be difficult to create great user experiences and that working with design requires in-depth knowledge and experience. It is also noted that about 60% of the respondents found the field of interaction design so interesting that they were motivated to gain knowledge beyond what their educational programs required of them. Although working with interaction design consists largely of teamwork and collaboration, the findings also showed that respondents enjoyed working individually with design ideas and prototypes, and not that much in teams. Furthermore, the respondents also preferred working with front-end design compared to back-end development (e.g. programming/coding) and the students generally preferred working with digital solutions over working with print and physical products. Regarding the role of an interaction designer, they found it difficult to define, since they

did not really know what would be expected of them after graduation. Some seemed slightly frustrated and were searching for an answer. One of the respondents said during the interview: "It is very difficult to answer exactly what we will do as an interaction designer and what will be expected from us, but I know that it is about including usability, design and technology." Beyond this, there were still some areas of focus they regarded as more important (e.g. communication within a design team, identifying users' needs, prototyping, etc.) than others. This was grounded in what they had learned during their education and the impression that they had gained of what would be expected from them when they enter a job in the design industry. However, the concrete tasks that were highlighted were coding (programming), interaction related to the design of innovative products, concept development, and user testing. Regarding this, there were some personal qualities and knowledge they felt were important to possess, which was linked to their knowledge of different technologies (software and programming languages), methodologies, tools used for user testing (e.g. survey questionnaires and eye tracking), knowledge of design principles, creativity, open-mindedness, cooperativeness, positivity, and to them being open to making "mistakes" and receiving input from others (both colleagues and users). Great teamwork was perceived as vital, although everyone should have his or her own responsibilities.

4.2 Awareness Pertaining to User Testing

As stated earlier, user testing was found to be an important activity and a vital component within the interaction design process. Figure 1 provides an overview of the findings in regards to user testing.
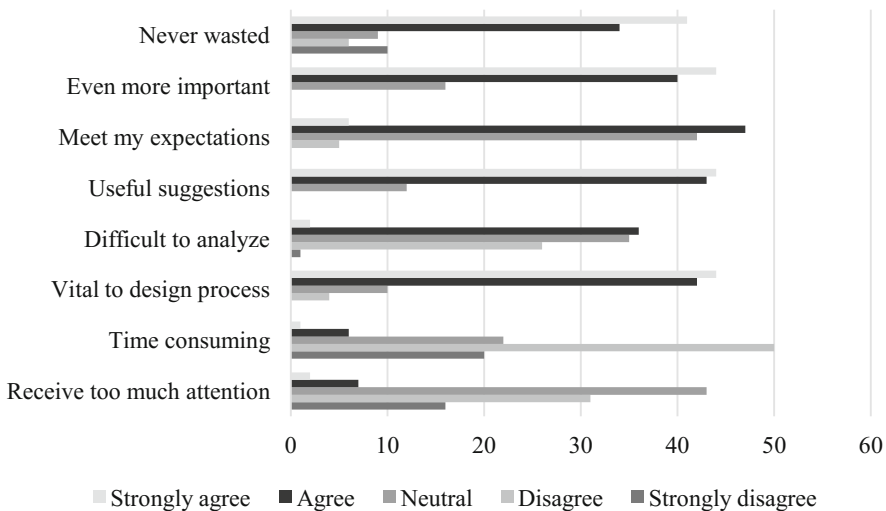

Fig. 1. Perceptions of user testing within interaction design (reported as a percentage).

Most of the respondents found user testing to be important to some extent and they clearly saw the value of such actions in the development of digital solutions and quality improvements. The respondents felt that user testing resulted in useful suggestions that could guide them further in the design process. However, the findings also reveal that a majority of the respondents found that the analysis of such data could be difficult, even though they could receive great input and comments from the users by involving them in the design process. They felt that the results of testing were often in accordance with their own ideas and beliefs, and about 50% of the respondents found that the results of user testing met their own expectations. Additionally, most of the respondents perceived that user testing would become increasingly important in the coming years and that user testing was never a waste of time and/or resources. One of the respondents explained during the interview: "Interaction design has become more important and people have seen it. You must create something that works; otherwise people will not have it!" Consequently, user testing provides great and useful suggestions for design improvements, however, performing the analysis of the user-testing data can be quite challenging. The respondents had only used a limited set of methods and techniques during their education and mostly descriptive analyses had been performed. However, the students experienced that they had learned new things that they could incorporate in their current projects and knowledge that they could use to their advantage in future projects. In order to create great user experiences, user testing was perceived as a vital component. In this regard, another respondent said: "It is important to get feedback, to figure things out—what is the best for users in different situations. But, it is not always that we do it like the test subjects want us to, it depends on what it is related to." There are obviously some suggestions (user feedback) that are more important than others are, but often the students felt that obvious findings were identified—viewed as simple because they were ignored by them initially. Another one said: "As a designer you have to be open to making mistakes, because you receive feedback all the time on what is working (e.g. through usability testing) and not." During their education, they had, in some cases, been more focused on details than on the overall user experience when working on design suggestions. They also found it easy to see trends when users pointed out many of the same things and provided suggestions for improvements.

4.3   Contribution to Products of the Future

Most likely, today's interaction design students will be important contributors to the future development of products. If we look back over the past two decades, remarkable technologies and changes in our digital society have occurred. Figure 2 shows the variance in the answers pertaining to the future of interaction design.

From the student's point of view, firstly, knowledge in interaction design will become increasingly important in the coming years, and it will be more demanding to develop user-friendly solutions in the future, as many users today have good experience with high-quality interactions. Furthermore, most of the respondents also assumed that the field of interaction design would develop in the coming years and they hoped to be important contributors in the future in designer roles. This was also anchored in their thoughts when in the role of a designer. One of the respondents explained: "This is a
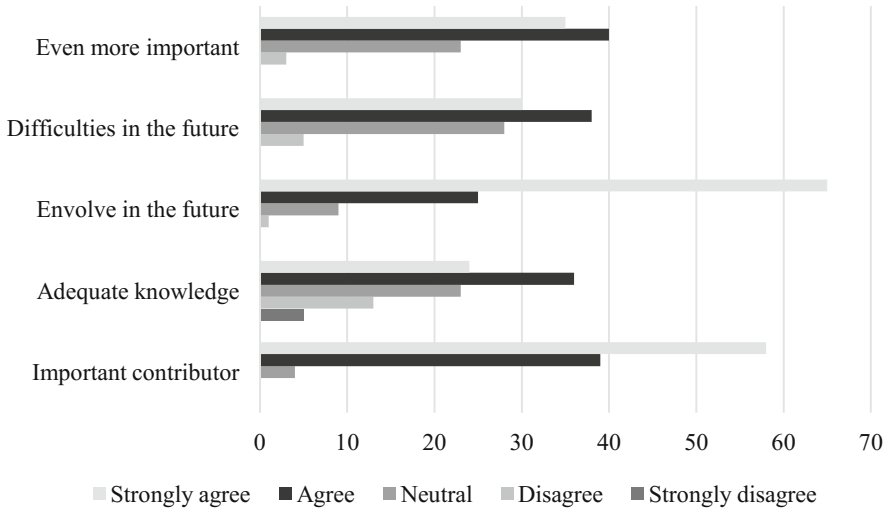
Fig. 2. Perceptions of the future of interaction design (reported as a percentage).

very exciting field in constant evolution. Exciting because there is no right or wrong. The users know best and you have to stick to design principles and usability goals. There is also a psychological aspect, how people think." Another respondent explained: "We can create something that's really good, but if UX does not work—it does not help." The field of interaction design will most likely be increasingly important in the future. Due to the ever-increasing number of digital solutions and innovations, we can expect that the role of an interaction designer will be influenced by this trend. In this regard, one of the students said: "Due to a growing degree of digitization, I think it is important that in the future more people should know something about interaction design, although they may not be primarily dealing with design issues in their daily work." There was also a consensus that interaction design would be part of several fields and an important part of many different types of projects. This was seen as even more relevant, as "everything" would eventually be digital, and in the future, it might become commonplace to have screen-based systems on the fridge and/or on other things when this is not common at present. Another one said "There is a lot development now, as in Internet of Things. Therefore, I believe there are going to be more physical products, with different forms of panels/displays. I also think it will be more prevalent with robots." The students also believed it would become more important for everyone to have knowledge in various fields (technology vs. design) because of the increasingly interdisciplinary nature of work. In terms of design, it was also viewed as important to have good knowledge of the technology so that a common understanding (within the design team) could be created easily regarding what should be developed and thus enable the creation of innovative solutions.

5   Discussion

Due to the ever-increasing number of digital interactions and the provision of online information and services within various business domains, we must facilitate high-quality interactions and great user experiences [2]. In this regard, the design of user interfaces and knowledge in the field of HCIs have received much attention within many research communities [4], along with management decisions and financial performance [3]. Concerning this, there is a need to conduct research that can contribute to future development and quality improvements [9]. To fill a specific knowledge gap, this study emphasize students enrolled on programs covering interaction design. The respondents who participated in the present study were at the beginning of their careers, and many of them envisioned long careers within the field grounded in a genuine interest in interaction design and product development. The majority of the respondents were also motivated to obtain great jobs in the future and personally felt they could be great contributors. Additionally, the students were generally more motivated to work with digital solutions than with physical products and print (e.g. magazines and newspapers). These results can most likely be explained to some extent by which university college the students were enrolled in, alongside the study program they had applied for. However, of particular interest in this regard is that the majority of the respondents have considered other study programs that are not necessarily related to interaction design. As a design team primarily consists of members with shared backgrounds and experiences [7], people with different approaches and fields of interest could take part in the design process. This might, to some extent, explain the variety of types of people in regards to personality and working interests that happen to work within this area. Important contributions of knowledge and experience can also be grounded in a large and wide area of interest, of which design is of course a key element. It may also be necessary to have other related knowledge to contribute to developing solutions with high usability. Furthermore, because it can be hard to build and develop great digital solutions [23], we need designers of such products that have expertise within the field of interaction design and in other related topics. Design is largely carried out by multidisciplinary teams consisting of people with diverse skills [7], which was also revealed among the participants. The role of an interaction designer is vital and interaction designers are important contributors throughout every design process, as the goal is to meet the users' expectations [6]. The design team can also be driven by the users, and in such cases, we must understand their interests and needs [16] to make the products usable by them. This study showed that the respondents preferred working individually with prototypes and design ideas over working in design teams. Most likely, various reasons can explain this, and one of these reasons might be that these students are inexperienced designers with limited training. After working in the field for some time, their self-confidence and interest in sharing ideas might increase. Alternatively, we can look at it the other way around: The respondents may feel that they already have great skills and knowledge that would allow them to come up with great design ideas based on their own ideas and expertise. In addition, the findings show that some students spent much time outside of the teaching program to acquire new knowledge. This is in line with what many practitioners also do [24], and it testifies to the fact that the field is undergoing major changes

and that keeping updated is of importance. Although many of the respondents felt that they had qualities and knowledge relevant to working with design, they also felt that they struggled to create high-quality solutions. This is in accordance with the literature (e.g. [23]), which states that we cannot guarantee usability in every project and that user testing and evaluation is highly important (e.g. [2, 17, 21]). Among the interaction design students, usability assessment was found to be an important activity during the design process. Such testing and quality evaluations contribute to the data that are central to the design process, so that designers can receive guidance and make the right decisions. The comments from students also showed the importance of being open-minded and the necessity of handling feedback and input from others, which is not always necessarily positive, in a constructive way. However, the respondents found that the analysis of user-testing data could be challenging, although the results often met their expectations. The findings also showed that the methods they used in their education tended to be relatively simple and the analyses were often descriptive and less sophisticated. This might be explained by the complexity of such data and the fact that the process of analysis often requires experience and knowledge regarding how to apply the results to the design process.

Regarding the future of interaction design and the fact that digital communications will increase, the respondents in this study felt that knowledge within this field would be significantly more important in the coming years. In light of this, it would also be more demanding to develop high-quality solutions that provide a user-friendly experience. Perhaps this is because of the growth of digitalization that we see today and the high levels of competence and skills of the users, who are more demanding compared to how they were some years ago. Grounded in this, the respondents believed that the field of interaction design would progress further and that competence within this area would become increasingly important in the coming years. In this regard, the majority of the respondents felt that, after completing their education, they would have enough knowledge, experience, and practical skills to cope with what the future would most likely bring. Such findings can highlight the education programs offered in this field. One approach might relate to examining the extent to which education meets the needs of the design industry, whereas another approach might involve examining the extent to which educational programs in higher education meet the students' expectations. Moreover, today's students are somewhat uncertain about what really is expected of them and about the role an interaction designer should fill. Prior studies has also questioned the role of an interaction designer [12]. Despite key topics being covered in their educational program that are central to this kind of work, there was still some uncertainty about the detailed expectations (e.g. technology vs. design-related tasks) and about the in-depth knowledge that would be required. Although this, to some extent, will depend on the type of company they will work for and their expectations/needs, it might be a sign that a position as an interaction designer in many ways is open and must be concretized in a significant way for the individual employee.

6   Conclusion

Interaction designers are important contributors with unique expertise and knowledge that will allow them to produce great products and solutions in the coming years. Today's students in such educational study programs will therefore play a vital role in this field and will have a significant influence on various design and technical issues in the future. Drawing on the findings in this study, the following concluding remarks can be made: The students of today find themselves to be in great shape for work as interaction designers, and that they are versatile and flexible in that they will most likely be able to contribute in diverse ways. They also have interests beyond pure design skills, which shows a diversity of different types of personalities and interests. As interaction design is a large and somewhat undefined field, the position requires different skills and the ability to familiarize oneself with new tasks. This might be challenging in regards to how educational institutions teach to fulfill the needs within the design industry. User testing and evaluations will be even more important in the creation of products in the future, as the number of new innovations, products, and screen-based systems will most likely increase in the coming years. The role of and the expectations required for an interaction designer seem to be slightly vague and unclear, along with expectations and requirements set by the design industry versus what the students have learned during their education. To add to the body of knowledge, future research studies could advantageously focus on the link between the actual content of educational programs (including curricula) covering interaction design and the need for such programs within the industry. Another interesting approach would be to follow up with a survey investigating how well the working tasks for interaction designers match the personal skills developed during interaction design education, and the individual student expectations, interests, and motivations for being interaction designers. Finally, a study of archetypes (among interaction designers) could be undertaken based on the education the designers have had and the focus areas relating to an interaction design process that they have been trained in. Such a study can provide indications of what kind of competence students have acquired after ended education and various examples of interaction designers (archetypes).

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