



DESIGNER'S IDENTITY: DEVELOPMENT OF PERSONAL ATTRIBUTES AND DESIGN SKILLS OVER EDUCATION

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Abstract

Designers' Professional identity (DPI) is a social- and self-perceptive construct through which designers are able to identify themselves. To understand the development of DPI, not just as a profession but also as an educational process, there is a need to consider the designer as both individual and trained professional. These interactions become also a necessary foundation for professionalism that is especially important for design activity. For this study, a psychometric survey was developed by taking in consideration both aspects of DPI, making use of a set of elements distilled from literature as conceptual parameters for Personal Attributes and Design Skills. The survey evaluated professional self-awareness of design students at bachelor and master level; also providing a first profile model of the two groups. The dynamics of the relations between the DPI elements changes and develops very slowly due to the process of identity consolidation over the educational period. Further, DPI consolidates through a lifelong learning process. These results provide an initial insight into the development of DPI and the challenges of measuring this subjective aspect over education.

Keywords: Designer identity, Design education, Human behaviour in design, Knowledge management, Design learning

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1 INTRODUCTION

Professional self-identity is considered a 'state of mind', or an awareness level, on which one can identify him/herself as belonging to a professional group. The formative process of Designers' Professional Identity (DPI) development starts during professional education and continues lifelong, throughout practice (Godsey, 2011). This professional consciousness plays an important role in one's confidence and professional development since it is a core element of personal identity (Skorikov and Vondracek, 2011). Thus, the sense of belonging to a group, and so to a profession, is an integrative part of the self and directly reflects one's development and performance in a work context.

The process through which a designer comes to develop a distinct professional identity has been widely discussed in terms of designerly ways of thinking or as competencies and abilities (Cross, 1982; Adams et al., 2011). Lawson and Dorst (2009) also highlight "*identity*" while discussing expertise in design, questioning the "something more" that could compose design learning rather than just skills acquisition. The development of a professional identity is affected by social, demographic, and personality factors (Crossley and Vivekananda-Schmidt, 2009), requiring the integration of one's personal values, morals and attributes with the norms of the profession (Cowin et al., 2013) and technical knowledge. Thus, although a few studies already discuss aspects of personality, the link between the psychological dimension and the development of skills in design is still little described (Kunrath et al., 2016). As such, there is a need for an investigation that integrates personal aspects and required skills as variables of professional identity, which underpin the processes of self-identification as a designer.

This paper takes the first step towards this understanding by answering the RQs: 1) Are students' self-awareness of Personal Attributes and Design Skills aligned with the Design literature? 2) How does the professional identity evolve over the course of education? The long-term objective of this research is the creation of a model of designer's identity formation process. Thus, specific implications for further research are also described.

This paper presents the data from a psychometric survey study and provides the first insight into the development process over an education in design. Results are discussed based on the first descriptive statistical analysis of the elements obtained by this study, and their significance is explained in the context of a proposed holistic model of designer identity.

2 LITERATURE REVIEW

The study of professional identity development covers many fields of research and practice. It has deep roots in psychology studies that discuss aspects of the self and identity in many branches on which personal development and occupational identity interact (e.g. Schwartz et al., 2011). However, research on identity is also found in Management and Human Resources, where work environment and professional satisfaction shape improvements in competence and performance on many levels (e.g. Ashcraft, 2013). In the same sense, research on Professional Development and best practices in Design can provide a deeper understanding about professional designers, due to the evaluation of several aspects and in a context, in order to better adapt the individuals to the challenges of the field by guidance (Evetts, 2003; Tracey and Hutchinson, 2013). While the elements that characterize professionals are discussed, modeled and improved in a broad scope of literature in other research fields (such as in health care management), this topic is still underexplored when considering the unique set of characteristics and environment in which design professionals are immersed.

To identify and map the elements considered to be important personal attributes and design skills, a systematic literature review was conducted in a prior study by Kunrath et al. (2016). From this review, elements considered as being important or required for designers and design activity were distilled from the literature. Further, the list of elements was categorized as either related to Personal Attributes or Design Skills. As such, this paper builds on this review as the foundation for the survey described in Section 3.

The elements classified as Personal Attributes are those that describe the designer's characteristics related to psychological aspects i.e emotions, feelings, attitudes and behavior. Hence, they are not related to technical abilities but rather to the inner state of socio-psychological and values-based comfort in which one feels (Tam et al., 2008). Further, they are externally expressed through being a designer and in the relation between mind and body turned into attitudes (Dall'Alba, 2009). Due to its psychological nature, Personal Attributes also relate to personality and personal behavioral approach, which are known

for relying on temporal consistency, changing very slowly and gradually over time (Brooks et al., 2010). In this sense, a slow development of the Personal Attributes' set of characteristics is also expected while measuring DPI. Note that, by Personal Attributes, we do not refer to personal aspects that can be easily trained within the professional education and training, i.e attributes of internalized erudition and skills of a certain profession that a person possesses (Cowin et al., 2013). Rather, Personal Attributes aligns with e.g. character, values and their expression.

The elements classified as Design Skills are those that describe cognitive, technical and behavioral characteristics related to the specific practice of design activity. These elements compound the set of skills necessary to successfully develop a design process, and are not specifically related with the designer itself. Rather, they are characteristics that can be directly trained within the educational and practical contexts (Horváth, 2006). This set of competencies develops more rapidly due to formal learning processes, since higher education is meant to align expectations between industry and professional education in order to increase employability (Jackson, 2014).

The undergraduate period is usually an uncertain stage of life in which a student fits into the category of *Occupational Identity Moratorium*, described in Psychology as "an active process of exploration and crisis and temporary inability to make a lasting career commitment" (Skorikov and Vondracek, 2011). This kind of uncertain self-concept shaping might extend throughout the educational period, impacting on the transition from student to a professional level, and reinforcing the importance of professional assistance in career commitment and development. It is expected that no higher professional identity development would be happening during the student phase of life, while design students are slowly shaping their overall identities, and with little or no immersion in practice. However, the understanding of this transitional process allows the development of stronger and effective guidance through higher education, helping to shape confidence in the students' professional knowledge and skills (Zou and Chan, 2016).

Thus, the union of personal and technical attributes provides a holistic overview of Designers' Professional Identity (Kunrath et al., 2016). Furthermore, the DPI elements guide and influence all decisions that are taken within a design project such as the designer's behavior within the work environment, project team interactions, and design process progression (Adams et al., 2011). Together, Design Skills and Personal Attributes establish a substantial amount of interconnections that allows the development of the Designers' Professional Identity lifelong, based on an ongoing construction of self- and social perception as being a designer. The elements that compound this understanding set the path of becoming a designer, providing marks on which thinking, feeling, perceiving, behaving, and being a designer are based (Kolb et al., 2013; Dall'Alba, 2009; Adams et al., 2011). This study brings together the elements from both Personal Attributes and Design Skills and provides the first measurement of these elements among design students, by comparing bachelors and masters in order to identify differences and trends of development.

3 METHODOLOGY

The present study employs a cross-sectional questionnaire-based survey methodology to collect information from two levels of expertise in design: bachelor and master students graduated within the Design & Innovation (D&I) program at DTU - Technical University of Denmark. The data gathering was done applying a self-administered online questionnaire, using the Qualtrics platform, as a psychometric test with a duration time of around 20 minutes. The participant students were accessed during the autumn semester of 2016. The surveyed Population (N) is compounded by two clusters: bachelor students (240) and master students (188). Of these 248 design students, 104 bachelor students and 79 master students agreed to participate in the study, in a sample fraction of 42% and 43% respectively. The average response rate of the survey participants was 83% for bachelors and 63% for masters for all the questions.

The test allowed the respondents to say how much he or she identified with pre-set self-statements related to elements of design, examined in two dimensions: i) Personal Attributes Measures, where specific questions were used to investigate designerly traits previously identified in the literature; ii) Design Skills Measures, where personal constructs about skills and career development are elicited. Thus, the survey provides a holistic map of a designer at different levels of professional education by sampling the beginning and final stage of the educational process.

3.1 Survey and Measures

In developing this survey, we built on the elements identified in a previous systematic literature review of the design field (Kunrath et al., 2016), as discussed in Section 2. As a second step, the survey's Likert-type scale items were developed in order to match the design field context. The development of items specifically for this study was required since no previous model or set of survey items could be found addressing the specific focus in design.

The process of survey development involved careful instrument design, with particular attention paid to question wording. Therefore, item choice, revision, and writing were guided by prior definitions of each construct in the design literature. When creating new statements several principles were used in order to write items that (a) reflected the construct definition, (b) were distinct from the other identified characteristics; (c) did not exceed a maximum length (20 words); (c) did not have an explicit measurement meaning. These principles also follow Robson and McCartan (2011) and Rust and Golombok (2009) suggestions for designing self-completion questionnaires. The developed items were then piloted on a test population. Based on this, changes were made to improve the measures or otherwise to clarify the items. Table 1 illustrates, as an example, the model of items used for one of the measured elements and also the sentences associated with its element. The questionnaire is comprised of 50% positively-keyed sentences and 50% negatively-keyed sentences (referring to the opposite relation/meaning of the intent measurement) in order to reduce the effect of acquiescence bias (Furr and Bacharach, 2013).

Table 1. Example of element's items developed and used on the survey

Element	Items (self-reflective sentences)	Relation
ETHICS	I consider environmental and social aspects when designing	+
	I am interested in the entire chain that supports my product development	+
	I always aware my client if the idea can have possible negative consequences	+
	I prefer to design beautiful and valuable things	-
	For me, design is all about aesthetic expression	-
	I don't mind about the laws when designing	-

A simple response scale measurement was used in this survey, in order to make answering faster and the understanding of the items easier (Morgeson and Humphrey, 2006). The use of a multi-item scale was necessary due to the expected small sample size, in order to measure weak effect within each category. Also, complex response scales have been shown to add substantial amounts of construct-irrelevant variance (Harvey et al., 1985). As such, all items used a 5-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree) with no neutral option in between. Rather, we inserted a point valued as zero "I don't know" on the right position of the scale. This point is not included in the metrics but allowed the respondent to inform us if they did not understand the question, did not have an opinion, or did not know the answer, without compromising the positioning on the valid points. As addressed by Rust and Golombok (2009), the use of a scale with no middle point is an alternative to reduce *indecisiveness*. The level of agreement with the item in question also represents the level of awareness about the measured topic.

The questionnaire was composed of 90 items in the two main areas: Personal Attributes, 42 items from 7 elements; and Design Skills, 48 items from 4 elements. Most items within Design Skills referred to the job itself rather than to an individual's reaction to the job, reflecting the respondents' perception of their behavior and performance in the workplace. Individual reactions and perceived personal characteristics were treated by the personal elements. To achieve adequate internal consistency and reliability yet maintain reasonable survey length (Morgeson and Humphrey, 2006), six items was used to assess each element, as shown in Table 2. The items were randomly distributed and automatically randomized within the group for each participant.

All the scales were refined and submitted to pilot testing and underwent two waves of formal pre-tests among researchers to assure readability, intelligibility and content validity. Comments and suggestions provided from the pre-test were used to revise the questionnaire, such as to remove ambiguities and other sources of confusion.

Table 2. Designers' Professional Identity Elements for measurement

Categories	Elements	Description	Nr.
Personal Attributes	Ethics	<i>Awareness and positioning about any possible environmental, social, health or design life performative consequences, or lack of compliance to legislation.</i>	6
	Emotions	<i>Sensitivity to external inputs, self-awareness, and management of personal feelings, also related with moral and empathetic aspects.</i>	6
	Social abilities	<i>Perceived facility on the exchange of tacit knowledge via joint activities: being together, living in the same environment, sharing experiences, and transferring ideas to other people.</i>	6
	Leadership	<i>A sense of autonomy and managerial attitude, searching and promoting ideas among strategy and business view together with peers guidance and inspiration.</i>	6
	Responsibility	<i>Motivation and willingness to learn, assuming responsibilities from mistakes, conscientiously assuming risks, taking care of project details, deadlines, and working within own beliefs</i>	6
	Openness	<i>Acceptance and embracement of new and unusual ideas or methods, being able to make changes to the work plan relying on the ability to improvise and remake. Also refers to the capacity to deal with different topics and to work with people from different cultures, ideologies or beliefs.</i>	6
	Confidence	<i>Certitude of its own personal abilities and professional competencies, being able to embrace innovative ideas and to start challenging projects, justifying own beliefs and (ethical) work.</i>	6
Design Skills	Cognitive Skills	<i>The capacity of think 'designerly'; understanding the nature of the problem to be solved; developing a distinct way of thinking that set the notions about the problem and solution spaces; demonstrating a high level of abstraction ability during exhaustive idea generation processes, subjective interpretations, and evaluation rounds. This dynamics of understanding, thinking, abstracting and evaluating the design problem leads the designer to set strategies of learning, problem framing, solution development, and problem-solving that allow the flow of these cognitive abilities.</i>	12
	Communication Skills	<i>Awareness of it communicative ability in a personal and interpersonal level. It comprehends the capacity to communicate clear and directly, attending to details and empathizing with an audience. Also, to make public presentations, set collaborations, establish rapport, and communicate among a team.</i>	12
	Technical Skills	<i>Educational and practical knowledge in design. It undertakes awareness of basic and specialized competencies that compound the formal education in design, and also technical language, imagination/representation quality and speed, IT competencies, negotiation, and knowledge appliance ability that compound competencies based on practice, expertise and know-how.</i>	12
	Management Skills	<i>Perceived managerial competence in a personal level and with the colleagues or among the team. Also, competence in developing and managing the project such as planning, progressing among the tasks and phases, and evaluating effectiveness and outcomes.</i>	12
Total number of items			90

4 RESULTS AND DISCUSSION

Professional self-identity is a framework in which personal and professional elements are taken into account. These elements start to be developed during the professional education process and are expressed as changes in awareness of behavior and knowledge over time, also becoming a pre-requisite for taking up professional responsibilities and values. As such, we first outline results for each population (Bachelors and Masters) before discussing development over time.

4.1 Bachelor Students in Design

The beginning of education in design is at the bachelor level and describes the starting point of the developed knowledge and professional perception in the educational process. The majority of respondents at this level were actually in the middle of their educational process at university, within the 2nd year. Figure 1 represents the sampled students in a radar graph in order to give a profile overview. The results, calculated by the mean of each category, broadly align with the elements derived from literature but the awareness level of the respondents is relatively low. The element Openness, related to Personal Attributes, usually express a way in which the students see themselves as being "open minded" and showed the highest score for this group of respondents. All the other elements rated quite low, especially Technical Skills.

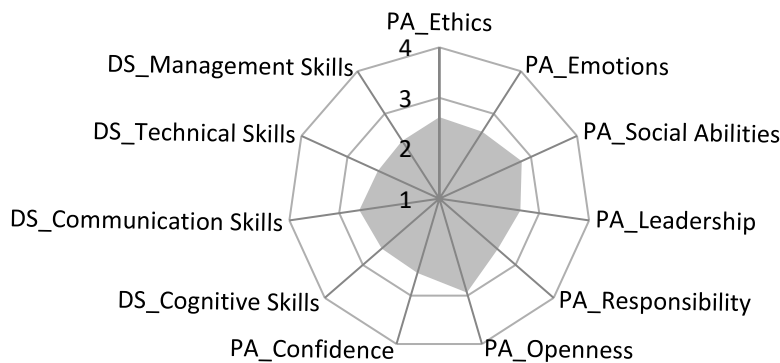


Figure 1. Radar graph of elements from Bachelor students in Design

4.2 Master Students in Design

The Master level might be considered the last stage of formal education, from where a student can choose to become an academic or go to industry. Thus, it is expected that this set of respondents already has all the educationally provided knowledge, having also developed skills of "professional beginners", while still lacking expertise from working in the field. Figure 2 represents the profile of master students. Here, the master students present higher agreement with the elements than the bachelors, and so perceive themselves in a slightly more rounded and robust profile in comparison to Figure 1.

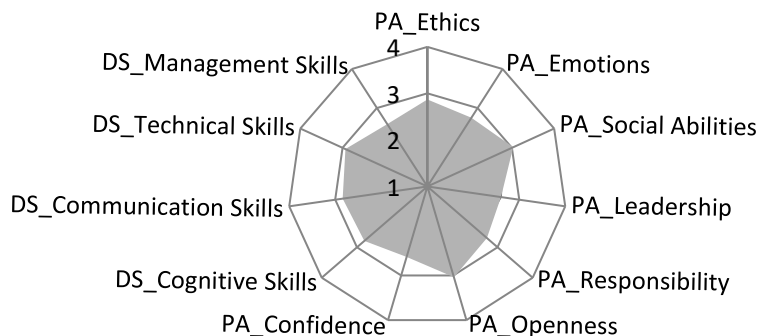


Figure 2. Radar graph of elements from Master students in Design

4.3 Development of the elements over education

In order to give an initial insight into development over time, a coarse comparison of means was undertaken across each element. Further analysis of this development is on-going and is outlined in Section 5, however, these initial results provide key insights into the two main RQ's outlined in Section 1. Thus, by comparing the profiles from bachelor and master students it is already possible to visualize a small change in self-perception and awareness levels across elements over the educational period. Figure 3 illustrates this comparison and the increase in awareness related to mainly Design Skills (DS), that is the focus of education. To which the elements related to Personal Attributes (PA) present the stability that characterizes a slowly changing process associated with this group of elements.

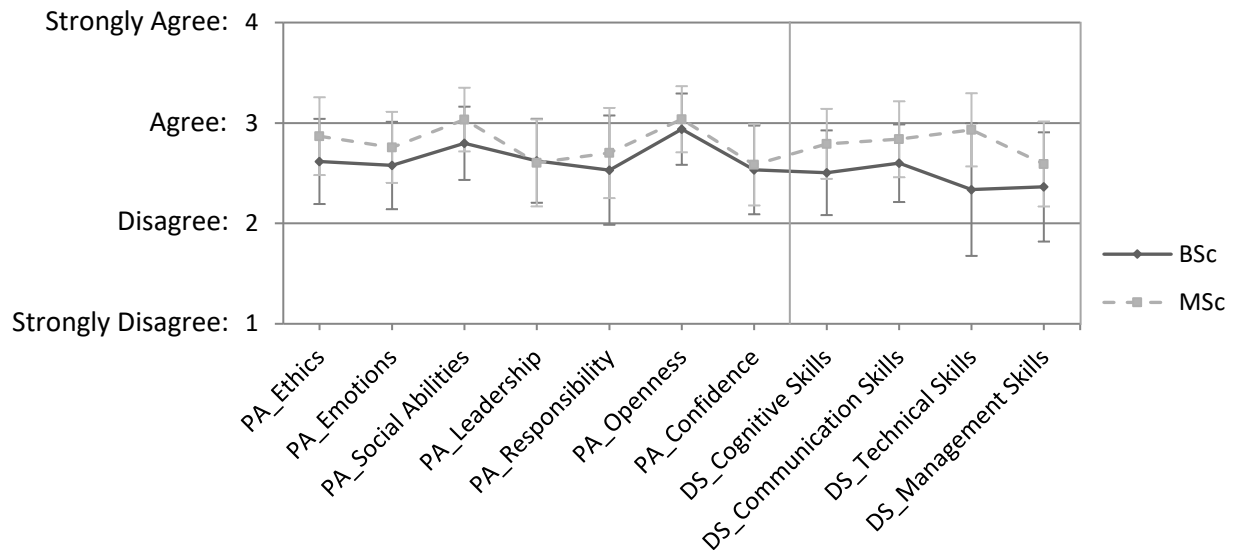


Figure 3. Comparison graph of elements between Bachelors and Master students in Design

The positive changes in the means of the elements related to Design Skills can be associated with the educational and training process over the undergraduate period. The curricula that compose design education in the measured university embraces the development of Cognitive, Communication, Technical and Management skills, which is reflected in an increase of 20% on the average mean for Technical competence and around 10% for the other three elements at the masters level. However, within Personal Attributes, only the first three elements present a difference in the mean average of around 10%, while the other four elements have shown little change (Table 3).

Table 3. Descriptive Statistics of DPI elements for BSc and MSc.

	BSc			MSc			Difference between BSc and MSc	
	Mean	SE	Var	Mean	SE	Var	Diff (%)	T-test
PA_Ethics	2,62	0,42	1,23	2,87	0,39	1,10	0,25 (9%)	0,42
PA_Emotions	2,58	0,44	1,02	2,76	0,35	0,78	0,18 (7%)	0,42
PA_Social Abilities	2,80	0,36	1,02	3,03	0,32	0,89	0,23 (8%)	0,39
PA_Leadership	2,62	0,42	1,03	2,60	0,43	1,17	-0,02 (-1%)	0,40
PA_Responsibility	2,53	0,54	1,37	2,70	0,45	1,37	0,17 (6%)	0,48
PA_Openness	2,94	0,36	1,08	3,04	0,33	0,95	0,10 (3%)	0,48
PA_Confidence	2,53	0,44	1,27	2,58	0,40	1,08	0,05 (2%)	0,43
DS_Cognitive Skills	2,50	0,42	1,06	2,79	0,35	0,91	0,29 (10%)	0,37
DS_Communication Skills	2,60	0,39	0,93	2,84	0,38	1,07	0,24 (8%)	0,36
DS_Technical Skills	2,34	0,66	1,66	2,93	0,36	1,07	0,59 (20%)	0,13
DS_Management Skills	2,36	0,54	1,51	2,59	0,42	1,16	0,23 (9%)	0,30
Total	2,58	0,45	1,20	2,79	0,38	1,05	0,21 (8%)	0,38

The currently differences in the means were not found to be significant for the individual elements, due to the high variance of the responses among the categories (Student's T-Test: single-tailed distribution, heteroscedastic). However, considering that the two groups, Personal Attributes and Design skills, develop at distinctly different speeds, the difference among the groups becomes more expressive and significant when measured as a whole, also indicating alignment with the framework of DPI development in these two sets. The measurement considering all the elements within Personal Attributes or Design Skills presents considerable differences between bachelors and masters: $p=0,082$ for PA and $p=0,006$ for DS.

The high variance within the responses is present for both groups, slightly reduced at the masters' level. This information supports the described "internal confusion", or *Moratorium* period, in which the measured subjects are in while still shaping a professional identity. Thus, it is expected that years of practice and immersion in a professional environment are required to overcome this noise in the data, and so the measurement of DPI elements to become more robust when with more experienced respondents. The measurement of professional subjects is planned as a given sequence to this study.

This first psychometrical assessment allowed us to visualize a clear tendency of higher agreement and awareness development over the designer's educational path. According to the expectations, the Personal Attributes presented a slower development expressed by a small difference between bachelor and master students. However, Design Skills present a significant difference as result of 2-3 years of students learning process at the university. From these results, is possible to estimate the increase of self-awareness development over education in design that is focused mainly on Design Skills.

The positive trend towards agreement, with the pre-set statements in the survey, over education, indicates the evolution of student's self-concept toward an alignment with literature in Design. This alignment trend with the conceptual aspects and requirements establish a bridge between theory, practice and the construction of a professional self in the design field. Thus, the measurement of all elements and how they are expressed indicates the first step towards a better understanding of career development in design.

5 LIMITATIONS AND FURTHER RESEARCH

The study, as a primary exploratory compiling of this survey, has some limitations. First, the results are related only to students enrolled at a specific university. It represents students under developmental process within a technical university in a Scandinavian context that likely differs from design education within design schools or based in other cultural environments. Also, it does not constitute a traditional longitudinal study but rather a picture of these subjects at different educational periods: bachelor and master level. However, the general trends identified to support the usefulness of further analysis and data collection using this approach.

Second, it was the first broader data collection of a newly developed survey instrument that is still under refinement. Also, since the measured categories are based on a previous literature review this study might not have covered all possible elements in reality. However, books that frame design expertise and engineering design were used as secondary literature, and broadly align with the general improvement observed between bachelors and masters in this study.

Third, the in-depth discussion of the elements and its possible relations were limited here. External factors that influence high variance in responses, and might have played a role in increasing the variance within the responses could also be further analyzed through the refinement of demographic and experience variables within the data. Also, gender differences were considered not significant in this study due to a similar percentage of male (52%) and female (47%) respondents. However, it is worth further analyses to explore possible differences in the two groups, in particular if expanding the study to cross-cultural measurements.

Fourth, a wider evaluation would support more general conclusions about validity. The results from the survey were subjected to a commonly used validation process to assess the scale's reliability, validity, and unidimensionality, which was not presented in this paper for space reasons. As such, further reliability analysis and follow-up interview studies will be carried out in order to validate the findings outlined here. Some of the planned analysis are: **Internal Consistency Analysis (ICA)** to verify the if the items are true representative of the proposed category; **Exploratory Factor Analysis**; definition of a **Herfindahl index** to the categories in order to establish a meaningful-weighted measure that allows comparisons; and an **Exploratory correlational research** for all the items and elements. Following the

recommendation of Churchill (1979), items with low item-to-total correlation will be eliminated because they don't share sufficiently in the construct's common core. Hereafter, all scales were subjected to a **Principal Component Analysis (PCA)** and/or **Factor Analysis (FA)** with varimax rotation. The goal of the next steps of this research is the refinement of the survey that, allied with deeper qualitative data, could allow a better comparison among the clusters, including professional designers with different levels of experience. The results of the broader scope of this research and the data from the professionals in the field can also allow a further development of a tool to diagnose curricular features that influence the development of designers' professional self-identity over education.

6 CONCLUSIONS AND IMPLICATIONS

The process of learning how to become a professional in design, as well as the process of constructing a professional identity, demands both personal and technical growth. The elements that compound these aspects can be understood as Personal Attributes and Design Skills; intrinsically related with each other and, within an economic, social, and professional context, and evolving over time.

The elements that compound the framework of DPI used in this study came from a systematic literature review (Kunrath et al., 2016), and have been described as essential aspects for a designer. The holistic overview cannot be dissociated and measured by just one or another dimension (e.g. only by designers' competencies), rather it must provide a broader humanistic understanding of the designer that includes personal features and situational elements.

In this paper we examined how these elements developed over the course of an education by comparing bachelors and masters students in design with the aim to answer two main research questions: RQ1) Are the students' self-awareness on Personal Attributes and Design Skills aligned with the Design literature? RQ2) How does the professional identity evolve over the course of education?

The measurement from the survey indicates a trend of development in self-awareness level due to the progression in higher education. This positive trend indicates an alignment with the concepts from literature in Design over the development of professional identity. The analysis did not present a statistically significant difference, among the groups of students, for the elements when measured separately but rather when measured as two groups: Personal Attributes and Design Skills.

As separate sets of elements, the data confirms the expectation of different speeds of development between PA and DS. Thus, while Personal Attributes develops very slowly Design Skills are deeper developed and trained during the educational period. As the designers' career progress, it is expected that awareness will increase for professional designers, due to experience and strengthening of professional self-identity after the *Moratorium* period associated with learning a profession (Skorikov and Vondracek, 2011). However, a tendency of increasing awareness can be already perceived as a trend within the educational period.

The results bring implications for theory and practice in design, since they highlight trends in capacities and competencies development and also the relationship between skills and personal attributes. This has specific implications for both design education, as well as the management of skills development in practice. It is observed that a delayed professional self-identity shaping can become a barrier to successful transitions from student to professional level (Crossley and Vivekananda-Schmidt, 2009). The study also contributes a milestone in studies of professionalism in design, shaping the profile of bachelors and master students, comparing them through the evolution in self-awareness in a professional-related psychometric test, and setting the stage for further studies that provide an understanding of professionals in design, and the development of the student to an experienced designer.

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