

# OntoGender – An Ontology in the Domain of Gender and Sexuality

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## Abstract

Ontology-driven conceptual models are part of a prominent and growing area within Computer Science. Their use allows better knowledge about a domain, improving understanding, communication and analysis tasks. To develop OntoGender we worked not only on the domain of Studies in Gender and Sexuality, but also, we deepened in ontologies and Ontology Engineering, mainly UFO and SABiO, resulting in a more precise representation of the selected domain. The artifacts generated from this work were analyzed by a specialist in the field of Social Sciences, in such a way that the generated model was revised and adapted to better reflect the domain, as expected. Considering that the field of study is in a constant change, both in semantics and in terminology, the developed model expresses the current context, and we claim that it helps in a better understanding of gender and all its aspects. We hope that a better understanding of such a complex domain will have positive repercussions on society and in a prejudice that is often the result of little knowledge.

## Keywords<sup>1</sup>

OntoGender, Conceptual Model, UFO, SABiO, Gender, Identity, Sex, Orientation, Expression.

## 1. Introduction

Studies on ontologies in Computer Science are increasingly frequent, as they enable a faithful representation of a large and/or complex domain, generating benefits in the use of such a knowledge representation. Ontologies results in a better communication and understanding of agents involved in their use – these agents can be human or artificial ones. In a world where data analysis is a powerful tool, better algorithms and structured databases used by these algorithms are necessary. Ontologies can be applied to give rise to semantically structured databases.

Regarding the Study of Gender and Sexuality, a broad and controversial topic, possessing a terminology in constant update and expansion, a good communication and understanding capabilities are necessary, considering that it involves people who belong to groups that culturally, historically and socially experience discrimination, among other problems.

Gender, as a historical and social category, comes to figure in feminist studies, gaining centrality in understanding the fundamentally social character of distinctions based on sex. The word “gender” indicated a rejection of the biological determinism implicit in the use of terms like “sex” or “sexual difference” [1]. Scott [1] claims that “[...] gender is equally used to designate social relations between the sexes. Its use explicitly rejects biological justifications, such as those that find a common denominator for various forms of subordination in the fact that women have children and that men have superior muscle strength. Gender becomes, in fact, a way of indicating ‘social constructions’ – the entirely social creation of ideas about the roles proper to men and women”. In this way, gender is a mean of decoding meaning and understanding the complex relationships between different forms of

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human interaction. Conceiving gender as a social category imposed over a sexed body is fundamental to comprehend the term and its implications.

Differently from what is often thought, gender not only regulates the relations between men and women, but also regulates male-to-male and female-to-female relations. In this way, violence committed by one woman against another one is explained by the constitutive binary of gender relations that guide heteronormative relations. The adequate understanding of this phenomenon would answer for the formulation of fight strategies of gender, with greater potential for success. While the singularization of the enemy can bring a lose sight of the relation between the three basic social contradictions: gender/sexuality, race/ethnicity, social class [1] [2].

After introducing gender as an analytical and historical category, from Joan Scott onwards, it is important to demonstrate this historicity in the open dialogue between the Social Sciences and Queer Theory, in the 1990s, with North American Cultural Studies, which is sought as “a critical counterpoint to sociological studies on sexual minorities and to the identity policies of social movements” [3].

So, we have that “Based on this scholarship, queer theory operates as a set of intellectual claims, practices and political actions which – broadly speaking – challenge normative knowledges and identities. It problematizes the humanistic conception of the subject, especially the universalism and essentialism present in such approaches. Queer from this perspective is not an identity category, a new label for non-normative gender and sexual identities.” [4]. The Queer Theory represents a rupture from the Binary Theory that is present in the history of society. This theory states that a person is not guided only by a biological factor, a person is a result of social aspects, such as gender norms. Therefore, it is a movement of resistance against the normativity instated by society [4].

Ontologies have been applied in different fields, and in this work we decided to apply them in Social Sciences, specifically in Gender and Sexuality Studies. While in some domains ontologies are being used mainly as input to computational tools, the primary intention here is to highlight the role of conceptual models as a tool for communication and understanding between humans. The selected theme is controversial, generating intense debates, affecting people. Understanding the domain can be the first step in reducing the problems that the Society faces today with this issue. After making this decision and studying the domain, it was clear that it is complex, with a mixed terminology, which required intense study and debates, adoption of a specific view, among other considerations, which reinforced the need for this domain reference ontology.

OntoGender was developed applying Conceptual Modeling, Ontology Engineering and Unified Foundational Ontology (UFO) as foundation [5]. Highlighting gender in its four aspects (sex, identity, expression and orientation) [6]), as well as in social, legal, psychological, biological, economical aspects, which are influenced and influence the definition of the gender of an individual or a group.

After the Introduction the text is structured in the following chapters: chapter 1 presents brief comments of the studies of ontology and gender. Then, chapter 2 analyzes the concepts around gender, through a historical analysis of gender, sex, identity, expression and orientation. In chapter 3, there is the theoretical foundation, which addresses conceptual modeling, more specifically on ontology, UFO, and Ontology Engineering. In chapter 4, OntoGender is presented, with the diagrams created in the OntoGender Overview, Sex SubOntology, Identity SubOntology (containing as binary identity and non-binary identity). Finally, in chapter 5, the final considerations are developed.

## **2. The Domain of Gender and Sexuality Studies**

Every person has characteristics that make him/her unique or put together with other individuals. These characteristics may identify concepts such as social class, religion, and race. Safiotti [2] debated that “...the difference is not the other face of the identity. People situate themselves in the axes of distribution/conquest of power - gender, race/ethnicity and social class – thanks to the similarities they have with some others and to the dissimilarities that they carry in relation to other people”

In Gender Studies, in the field of Social Sciences, sex is a social construct and is also a recurrent term in Biology, but it does not define totally the male and female behavior, which has social aspects. What defines such behavior is the gender, which in turn is the individual's perception in face of society, which over time has instituted binary roles for the gender of each individual. Questions related to gender

and its binary roles occur when a person has a gender experience inconsistent with what society expects of his/her sex. As a result, there will be the occurrence of gender identity conflicts [6].

Over time, different terminologies were used to explain the characteristics, behaviors and norms of a biological notion of sex. That configures an individual. Joan Scott [1] demonstrates the usage of the term gender linked to the individual's birth sex. According to her, the proposed usage of the term gender by the French Language Dictionary of 1876, was: "It is not known which is his gender, if he is male or female, but it refers to a very reclusive man, whose feelings are unknown"[1]. And Gladstone made this distinction in 1878: "Athena had nothing of the sex, only the gender, nothing of a woman but shape". More recently - too recently for you to find your way in the dictionaries or in the Social Science encyclopedia – feminists began to use the word "gender" more seriously, in a most literal sense, as a way of referring to the social organization of the relationship between the sexes [1]. It is worth to emphasize that some of the cited European studies surrounding gender are based on North American studies, with a similar approach [25].

Biology is certainly not the only responsible for the womanhood of a person, but we know that the genitalia, at the time of birth, defines the "female" sex, once that person will be raised to be a woman, which will mean so much for her to understand herself as a woman and how to present herself to the society [7]. During the process of raising a person, if the person raised to become a woman claims herself as a woman, she will be on the "woman side", always bordering the invisible line that separates the genres, even if she flirts with what is found for beyond the line. However, if a person claims existence for himself/herself other than the one in which he/she was raised, in this example, meaning the existence of man, then it will be a trans man. Cis and trans terms are two reference points, two extreme points of a given division of the world – however, among them there is a wide variety of subjects [7].

Contemporary family roles have been deeply influenced by past changes in the economic structures of most societies, especially American. The processes of industrialization and urbanization, of the organization of most work into jobs within economically motivated organizations, and of the development of nation-states and of a series of accompanying cultural changes split the conceptualized world in many ways, including into two spheres, private and public. "Gender roles have always existed primarily to satisfy the need of a society to continue existing. Creating children and fostering their growth to self-sufficiency are the foundational needs that gender roles were created to meet. In modern societies, these needs are met more and more by a variety of specialized roles that exist outside of gender roles, yet we still perpetuate and reinforce gender roles in observance of tradition" [6].

"Major problems with understanding gender and social roles in this society are the rapidity of social change and the enormity of social diversity. Various aspects of the cultural models of major roles are constantly changing, first as deviations from prior ones, then as more accepted guidelines, and finally as old models to be gradually replaced\*-/." [8]. In this sense, OntoGender seeks to represent the historical expansion of gender concepts and relations. It is necessary to understand the social impositions made under this subject, and to analyze the aspects that are deterministic to conceptualize gender.

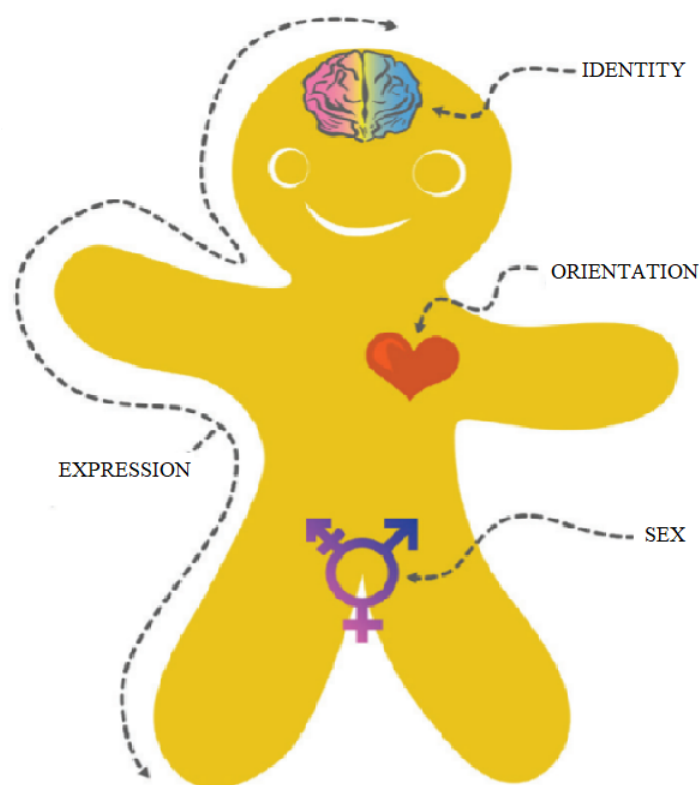
A core concept to be understood in this domain is the word sex. "Sex is the word we use to categorize certain physical anatomy someone has, based on how it aligns with what we understand to be "intersex," "female," or "male." The easiest way to examine these labels is with example characteristics" [6]. Considering sex as a social construction, in its most reductive form, as society usually does, being a female means having a vagina, ovaries, two X chromosomes, predominantly estrogen production, and the ability to have a baby in the abdominal area. Analyzing sex as a biological point of view, it refers to the physical traits an individual is born with, measuring organs, hormones, and chromosomes of each person. On the other hand, being male means having a penis, XY chromosomes, predominant production of testosterone, and the ability to get a woman pregnant. However, an intersex being can configure both sexes at the same time, breaking this binary theory of the social scope [6].

Biological sex, as well as gender identity and expression, has more nuances than we imagine without knowing deeply the subject. For example, an intersex person can be born with the appearance of an aesthetically masculine being (penis, etc.), but having a female reproductive system internally [6].

Figure 1 explains the main terminologies that make up gender, facilitating the visualization of concepts and their differences.

### 3. Applied Method and Theoretical Foundation

To develop any technological artifact, such as a software, it is necessary to understand its context, its domain and the problems to be addressed, beyond the technology itself. Focusing on the first aspects, one of the ways to do this is developing conceptual models, as they provide a more articulate perception of a real-world domain. Models are crucial in the processes of building an Information System, contributing to the domain knowledge and requirements engineering phases, processes that are decisive for the usability and acceptability of the final product [10]–[12].



- **Identity:** How a person recognizes themselves internally. Gender identity is an internalized interpretation of how one experiences and defines one's gender. Based on the individual's perception of a society, identifying himself with some social role, whether it be a man's or a woman's, or none - as seen in non-binary gender identities [6].
- **Sex:** It is a biological factor, the physical traits an individual is born with. See the measuring organs, hormones, and chromosomes of each person [6].
- **Sexual Orientation:** It is about who a person is physically, spiritually and emotionally attracted to. In other words, to whom a person has sexual attraction and romantic attraction. Labels tend to identify the relationships between an individual's gender and the gender to which he or she is attracted. If you are a man who is attracted to women, you are straight. If you are a man who is attracted to both men and women, you are bisexual. If you are a man who is attracted to a man, you are gay [6].
- **Gender Expression:** What a person externalizes based on their gender identity. While gender identity is more connected with the individual's perception of a society, an expression of gender refers to how he/she presents himself externally to this society [6].

**Figure 1:** The Genderbread Person [9]

A conceptual model focuses on identifying, analyzing and describing essential concepts and constraints of a given domain. To represent a model, it is necessary to use a modeling language. There are different options available, one of them is the Unified Modeling Language (UML), which consists of specifying, viewing, building and documenting artifacts that help in the modeling of information systems based on object-oriented methodology. Object orientation and the application of UML have been fundamental to software development in the last few decades, and this methodology has also evolved. In this work, we resorted to Conceptual Modeling Based on ontologies [13].

To develop OntoGender it was used the Unified Foundational Ontology (UFO) as basis, due to the extensive evidence of its quality and effectiveness, as it is shown in many articles as [14][15]. UFO was proposed by Guizzardi (2005), with the aim of reducing limitations during the process of capturing basic concepts in the modeling languages of other ontologies. UFO was a condensed ontologies of foundations, mainly resulting from the union of the GFO (General Formal Ontology) [16] and DOLCE (Descriptive Ontology for Linguistic and Cognitive Engineering) [17].

UFO is organized into the following divisions: (1) UFO-A, which focuses on objects - an example of an object is the entity Person, classified as the UFO stereotype Kind; (2) UFO-B, an ontology focused on events; (3) UFO-C, based on UFO-A and UFO-B to define concepts of the social sphere, for instance in the entity Will For Gender Designation represented with the stereotype Social Commitment [18]. UFO can be seen as a theory about categories of universals and individuals. In Conceptual Modeling, typically, universals are known as a concept/class or relation/association, while instances of these

represent individuals [19]. The present work mainly applied UFO-A and UFO-C as it was established that the part of the domain being modeled has characteristics corresponding to these ontological foundations.

For the development of an Ontology-Driven Conceptual Model, it is necessary to select an Ontology Engineering process. For the present work, the UFO foundation were applied with the support of SABiO (Systematic Approach for Building Ontologies) [20] methodology to design ontologies. OntoGender is a reference ontology. It is possible to study the effectiveness of the integration of UFO and SABiO through works such as in [21][22]. Another work that was analyzed to build the reference ontology, was GSSO - The Gender, Sex, and Sexual Orientation Ontology [24], that uses OWL (Web Ontology Language) for the ontology development. However, GSSO treats the domain from a pathological point of view while OntoGender focuses more on social perspective.

As OntoGender is a domain reference ontology focused on gender characteristics, and that SABiO was conceived in order to carry out the development for reference and operational ontologies, the methodology is intended to develop the best possible description of the domain under study. It is a solution that does not depend on technical specifications, but aiming on making a description of the entities of the domain precise, and facilitate communication, learning and resolution of the domain problem. From the moment that there is an agreement on the terminologies and the standardization of the conceptualization (reference ontology), operational models related to such ontology can be implemented. Unlike reference ontologies, operational models are developed focusing on desirable properties for computational application [20]. The mapping of OntoGender to an operational ontology is a future work we intend to develop.

In the SABiO the Support Processes are carried out in parallel with the Processes of Development, except for the Knowledge Acquisition process, which takes place in parallel only until the development of the reference ontology. To develop OntoGender, till now we applied the following SABiO activities: evaluation (initial phase); configuration management; documentation; knowledge acquisition; purpose identification and requirements elicitation; ontology capture and formalization.

About the developed activities: The evaluation process was applied with technical reviews from the beginning and it was carried out by an expert in the field of Social Sciences. All bibliography and studies that support the ontology were validated and meticulously selected, which helped in the knowledge acquisition process.

It was built a detailed documentation of the development process and generated artifacts, such as glossary of terms, that helps to define each concept of the ontology. The glossary is always growing along with the ontology representation, and the same occurs in the knowledge acquisition phase, applied during the whole process.

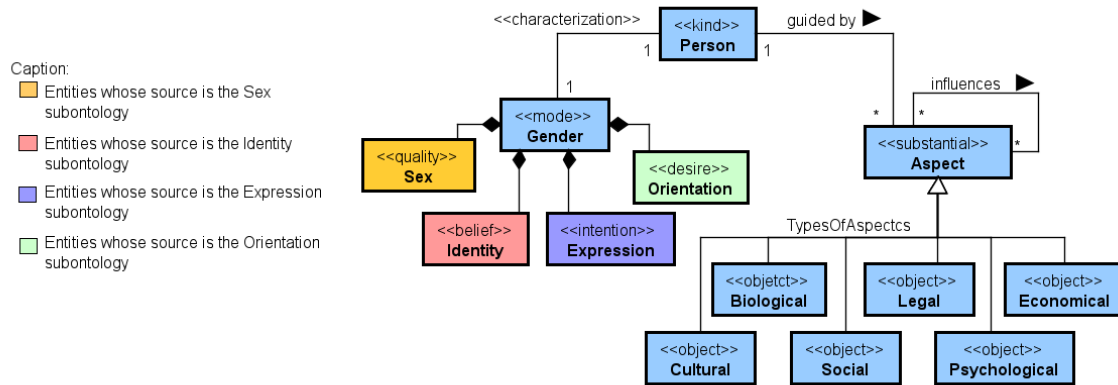
In parallel to the knowledge acquisition phase, it was executed the purpose identification and requirements elicitation tasks. Initially the purpose of OntoGender was to build a reference ontology that represents the domain of gender and sexuality. Since the beginning, the purpose was always clear, but with more study, it was deepened to reflect the social studies that surrounds gender.

During the modeling of gender domain, among the activities of support process, validation task was performed by a specialist in the field of Social Sciences. Also, the knowledge acquisition, was constantly applied throughout the entire process of production, in view of the wide variation in terminology, and the indeterminist semantic that many terms had. Here, the specialist role was, again, fundamental to build a realistic model, resulting in OntoGender.

#### **4. OntoGender – The Domain Ontology of Gender**

So far, the specification of OntoGender consists of a graphical representation with its complementary description, basic axioms and a glossary of terms. This section is basically dedicated to the graphical representation and its description. We emphasize that only a partial description of OntoGender is presented here, due to the restricted textual space.

We organized OntoGender in subontologies and diagrams. The first diagram is an overview of the main concepts adopted. It guided the development of the subontologies, acting as a guide to help in the navigation between the subontologies. The overview is shown in Figure 3.



**Figure 3:** OntoGender overview

In UFO-C agents are substantial that may possess different modes, the Intentional Mode is a type of Social Mode, the intentionality should be analyzed as "something that is proposed" in a way that each individual react to different situations in the social sphere. The intentional modes can be Belief, Desire, and Intention, these modes are very intuitive. OntoGender used such methods to detail the specificities of gender, such as Identity (belief), Orientation (desire) and Expression (intention).

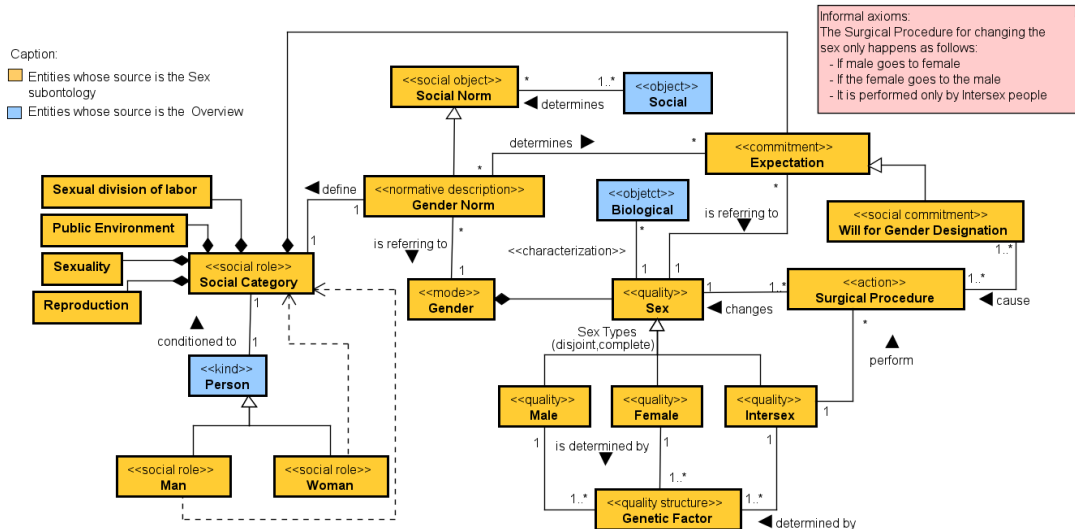
A *Belief* can be justified by situations in reality, such as the belief that the person was born in the wrong body, according to biological sex. On the other hand, a *desire* is linked to an agent's will towards reality things, for instance a person have the desire to date another person. An *intention* is a desire state linked to an inner commitment, for example enjoying playing with dolls, or wearing a certain type of clothing. Emphazing that Desires and intentions can be fulfilled or they can be frustrated. [18]

In the diagram of Figure 3 there is the *kind* Person – the core concept of the ontology, representing a human being - which is characterized by a *Gender*, which in turn is composed of four parts: *Sex*, *Identity*, *Expression* and *Orientation*. Also, *Person* is guided by some *Aspects*. There are several types of aspects that may influence each other, and they also influence a *Person*. For this work, six aspects were visualized, all of them classified as an *object*. They are: *Cultural*, *Biological*, *Social*, *Legal*, *Psychological* and *Economical* These *Aspects* that encompass a *Person*, are influential factors of a *Person* gender, as seen in the next section on ontology of the sex component, which in turn is influenced by *Biological* and *Social* aspects.

The first concept that composes *Gender* is *Sex*, detailed in Figure 4. For modeling the *Sex* component, a study in UFO-C was carried out, for the application of stereotypes such as *commitment*.

*Sex* is characterized by two aspects - *Biological* and *Social*. In a social point of view, sex is a characteristic of *Gender*, and in a biological point of view, there are three types of *Sex*: *Male*, *Female* and *Intersex* - these are determined by the *Factor Genetic*, characterized by several genetic structures that encompass a type of sex. The *Biological* sex is not always, and if so, not alone determined by genetic factors, there are other aspects that encompass *Sex*.

Regarding *Intersex*, this sex subtype has a peculiarity, which is the *Surgical Procedure*, indicating that several procedures can be performed by an *Intersex Person*, in order to reassign the sex to *Male* or *Female*. An *Intersex Person* usually has their sex assign at birth, or sometimes it can be find out later in life. In this way, the surgical procedure for an *Intersex Person* is an *action* that is caused by a *Will of Gender Designation*, which is a type of *commitment* *Expectation* expected under the *Intersex* type.



**Figure 4:** OntoGender - Sex subontology

Analyzing Sex from a Social Perspective as a part of Gender, we notice that there are Social Norms, determined by this aspect. These norms are specialized in Gender Norms and dictates all the implicit rules that there are in society, and when it is approached in a Gender spectrum it refers to dress code, expected behaviors and expectations in general. “Like all social norms, gender norms are informal rules that our society imposes on us and that we feel an immense amount of pressure to follow. But unlike a lot of social norms, gender norms are often formally taught to us, and the consequences for following or breaking them can be equally dire, depending on your individual identity” [6].

The Gender Norm is an important concept within the Sex subontology, because various Expectations regarding Sex, such as expectations to have a child and build a family, are determined by it. Another concept which is defined by the Gender Norm, is the Social Category. This category is composed of several concepts such as, The Sexual Division of Labor, Reproduction - these are key factors that characterize the Social Category, as a determining concept where a person is conditioned.

In order to comprehend the Gender Identity of a Person it is necessary to understand the concepts that clarifies what sex is. The modeling of Identity is shown in Figure 5. Identity was initially modeled with two specializations, non-binary identities and binary identities. However, the Identity model took a certain proportion that made it difficult to read, so that the conceptual model was divided into two types of identity (Binary Identities and Non-binary Identities – Figures 5 and 6).

In the Binary Identity subontology there is the Identity, which is a concept that encompass the Person, and characterizes how a Person identifies herself/himself. The Binary entity is a type of Identity, and its definition is closely linked to the relationships of Agreement and Disagreement of the Identity with the Sex component of a Person. The entities Agreement and Disagreement are both *relators*, this UFO construct can be seen as a relationship objectification – here it was used to highlight that these concepts are relations between some *roles*. So, when a person sees herself (Identity) in agreement with the Sex that she was born with, this determines a *role* Cisgender of a Person. However, when a Person sees herself in such a way that is different from Expectations of the Sex she was born with, it is a characterization of a Trans Person, which is determined by the Disagreement relation to the Sex.

The *relator* Disagreement has a strong connection with the Intensity *mode*, once a Trans Person can have different levels of intensity from the feeling of Discordance, in such a way that there are three types of trans Person: Transvestite, Transsexual and Transgender. A Transvestite Person is determined to have a Light intensity, and the Transgender Person is determined by a Moderate intensity, and this person may have the Desire to Transition. This desire can provoke the Fulfillment of Transition made through the Gender-affirming Medical Procedures, in which one or more of this process is carried out in order to change the Sex of a Person. Finally, a Transsexual Person is determined to have a High intensity, and the Desire to Transition must exist for a Transsexual Person. This Person can be a

Transsexual Man or a Transsexual Woman - it refers to when a person identifies as man or woman aligns fully with the roles and norms ascribed to people born male/female sex in a society.

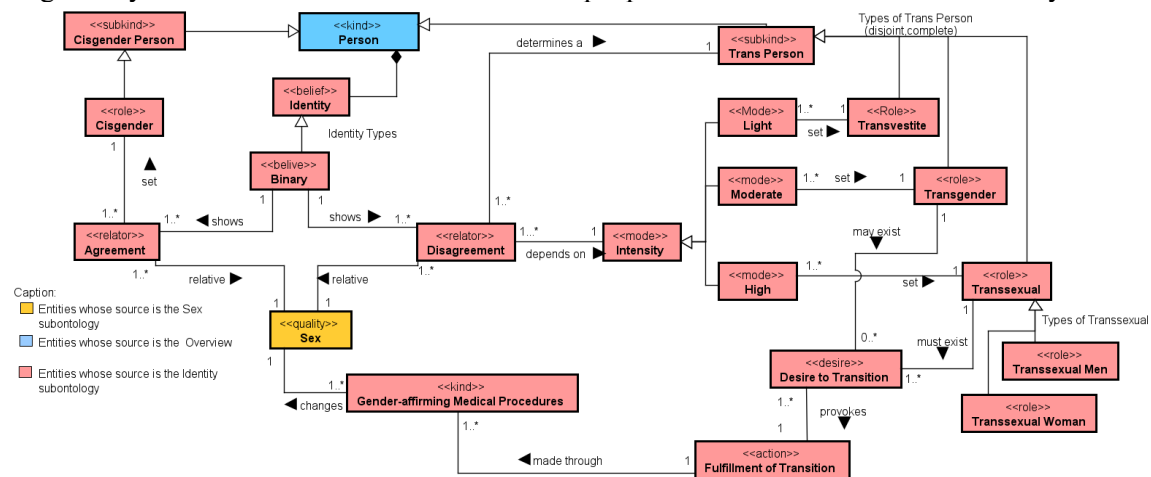


Figure 5: OntoGender - Binary Identity subontology

Concerning Transgender, we have that “As an identity label, folks who solely identify as transgender (or trans) have many different interpretations of what this means. For some, it’s interchangeable with the identity label “non-binary” (meaning a person who neither identifies as man nor woman); for others, it has elements of genderfluid” [6].

The Non-binary Identity model presents the Identity concept with identities of the non-binary types. The Non-Binarism entity represents an action of nonconformist to the Binarism. This feeling of nonconformism can be represented through dress clothes, behaviors and a disruption of the expectations about Sex. “For some of these people, a normalized binary is restrictive because they don’t see themselves aligning with either option but as more of a combination of both. And for others, they may see themselves as a third option altogether. Some folks who fit into these groups may use labels for themselves, such as ‘non-binary’ ” [6].

Non-binarism determines a Non-Binary Person, in such a manner that a Person can have one of the six types of non-binary identities. Even though there are more than six non-binary identities, in OntoGender we decided to delimit it having as a criterion the identities that are most common. Among the types of non-binary identities, there is Agender - the absence of Identity - and characterizes an individual that does not recognize and prefers not to recognize his/her identity as a binary entity.

The Gender Neutral is determined by indifference to Identity - for a Gender Neutral Person the identity is a factor that can not only be mutated, but also such mutations makes no difference to neutral identification as an Identity. Analyzing the Agender identity and Gender Neutral, both are characterized by a greater determinism, determined by either absence or indifference. However, a Demigender Person is defined by a partial identification, so (s)/he has an identification with some Identity, but this identification has a lesser determinism when compared to the non-binary identities that has already been presented. For example, a Demigender person may be completely genderless at a given moment, but identifies himself that way because at other times s/he has a defined gender.

From a binary point of view, the expression can be classified into Masculinity and Femininity. Varying between the two extremes there is the Genderfluid Identity which is commonly confused with the Androgyne expression. It is interesting to consider that the Androgyne is more connected to a clothing style, which combines both expressions, meanwhile Genderfluid is an identity that vary between expressions. The God Of Mischief (Loki) is a mainstream example of genderfluid person.

Finally, there is also a non-binary identity called Third Gender. This identity is very peculiar as it is determined by a Social aspect where this individual is traditionally supported by Cultural and Legal aspects. Some Third Gender cases are seen in India to describe Hijras and in Polynesia with Fa’afafine classification [23].





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