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# Using StructurANTion To Delineate An Actor Network's Information System

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**ABSTRACT**

StructurANTion can be seen as a framework for interpretatively researching organizational structurated orders in which humans and information systems, in combination, exhibit agency. This paper argues for, and describes, how the StructurANTion network may be used to understand the integrated development of information systems as constituted by humans and non-humans within organizational actor networks.

**Keywords**

Actor Network Theory, Structuration Theory, StructurANTion framework, Information Systems

## INTRODUCTION

This paper will explore and illustrate the mobilization of StructurANTion theory, for the integrated development of humans and non humans into network hybrids, predominantly within organizational settings and particularly with respect to information systems (IS). StructurANTion (Brooks and Atkinson, 2004, Atkinson and Brooks, 2003) has been used as an ontological lens to view and make sense of 'real world' scenarios encompassing humans and non-human technologies; in particular computer based information systems (CBIS). One of the main development areas is as a framework to underpin real-world practices. The argument for this arises from the two constituents of the StructurANTion theoretical hybrid: Giddens' Structuration Theory (ST) and Law and Urry's Actor Network Theory (ANT). Law and Urry (Law and Urry, 2002) reported that theory is a 'conceptual artifact' capable of being used as theoretical actor that "…can help to bring into being what it supposedly discovers". Giddens (Giddens, 1979, Giddens, 1977) also refers to this phenomena as the 'double hermeneutic'; the use and transformation of theory, to understand the world and as a pragmatic device with which people would seek to change it (Giddens, 1979, Giddens, 1984). That is, a theory can be used to help with our understanding of the world, but at the same time the use of that theoretical approach in itself can be used to 'drive' changes in a particular context. The StructurANTion theoretical hybrid draws legitimacy from this phenomenon of the double hermeneutic, and its status as a 'mutable mobile' (Law and Mol, 2000). It is a flexible conceptual non-human actor capable of being translated into a variety of real world situations, to understand them and to be embedded within practices, tools and techniques with which to create or change them. StructurANTion underpins the notion of socio-technical practices appropriate to the delineation of the IS within an actor network as a precursor to the latter's development and implementation. This paper adopts the term 'socio-technical enactment of theory' (STET) to capture the phenomenon where the theoretical 'conceptual artifact' is translated, via embedding it within tools, techniques and real world human practices, to effect change within or to bring into being CBIS enhanced actor networks. The paper briefly outlines StructurANTion theory, before exploring its use within practice.

## STRUCTURANTION THEORY

This section provides a brief overview of StructurANTion Theory and the concept of the humanchine actor network (Callon, 1986, Latour, 1999). The StructurANTion framework seeks to address the question: "How do networks of humans and non-humans persist and change over time with and without the omni presence of a coercive, supportive, manipulative, inspirational, leadership and drive of a focal actor that brought it into being in the first place?" Following Giddens (Giddens, 1984) it captures the autopoiesis (Maturana and Varela, 1980) of the humanchine actor network's structure agency relationship. Bringing together ST and ANT into StructurANTion theory enables the view of it as a mutable conceptual device, not only capable of forming alliances with people to interpret the world, but through such alliances, one potentially capable of affecting agency. See Atkinson and Brooks (2003) for a more detailed discussion which set out the procedural (the 'how' rather than substantial 'why') grounds that support the melding of ST and ANT to form 'StructurANTion'.

Within the StructurANTion framework is the idea of the duality of the human and the machine (ie. the humanchine) which together can be seen as 'the actor who acts', eg. in the case of the AMCIS conference, the authors enact the non-human 'technique' that is the 'double hermeneutic' making up an interpretative humanchine, (a machine being here the material manifestation of some form of technique) network whose intention is to mutate theory and demonstrate its use; in turn, this actor network, contributes to this paper artifact and its content of discursive actors; in turn, this network along with all its other actors in the academic paper production process, such as the PC, the Internet, the English language, the traces of other authors and their papers, reviewers, editors, the AMCIS authoring web site, etc., all constitute the conference paper producing humanchine actor network. In order to persist and behave, a network has structures that reside within the heads of the humans (though *not* in the machines). The structures are identified by Giddens as 'Signification', 'Legitimation' and 'Domination'. StructurANTion identifies an additional structure 'Emancipation'; underpinning agency directed toward overt change of the network and its 'structurated order' (see Figure 1). These structures manifest themselves as modalities. Such structural modalities manifest themselves as cognitive resources within the human's minds that humans draw on to facilitate agency. These modalities are also inscribed in the machines within the system; either in their physical functionality or, in the case of computers, within their programming and databases. These modalities enable the humanchine actors to communicate with each other through common stocks of knowledge; they sanction the rights and obligations of their actions; they allow them to authorize the behaviors of human and the allocation of non-human actors to perform some task (in concert with the human).

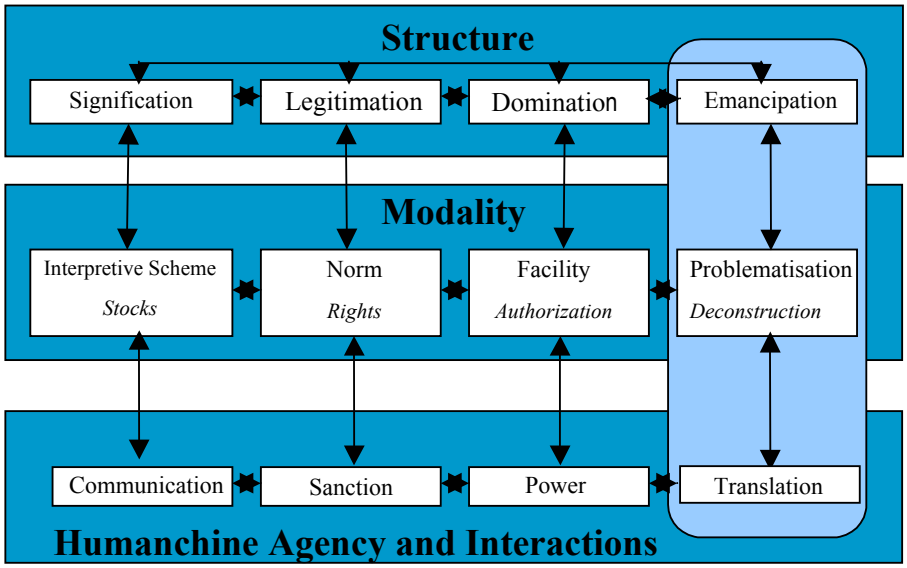



**Figure 1 The StructurANTional framework**

Structures exist within people's heads (Giddens, 1984); they are also inscribed, through their development and deployment, within technologies functionality in the form of their modalities. A human's capacity for reflexivity, the autonomic non-conscious cognitive monitoring of these structures and their modalities results in the latter being recursively reproduced as well as incrementally changed. This is done in response to the human's own, other actor's and humanchine networks' behaviors. The machines do not have this inherent capacity. Technology can play a role in overtly enhancing human reflexivity. It achieves this by explicitly monitoring a network's own and others agency and their outcomes.

## DELINIATING THE STRUCTURATED ACTOR NETWORK'S INFORMATION SYSTEM

This section explores how the StructurANTion theoretical framework is used to delineate the IS of an actor network as a precursor to the latter's design and development, within a process of organisational change and development that encompasses the whole of the network. The IS of an actor network is not a single actor within an actor network; though the information technology (IT) could be seen as such. Rather an IS is constituted from activities and behaviours of human and non-human actors within a network directed toward the creation, capture, manipulation, provision, destruction and deployment of information. Though the application of StructurANTion to this exploration is novel here, the concept of an IS is not unanticipated within the IS discipline itself (Kling and Lamb, 2000, Kling, 1992). Witness Hirschheim's (Hirschheim et al., 1995) description of an IS and the actors who perform it: "…an IS consists of a collection of people, processes, data, models, technology and partly formalized language, forming a cohesive structure which serves some organizational purpose

or function. Through performing these elementary functions, IS facilitates the creation and exchange of meanings that serve socially defined purposes such as control, sense-making and argumentation."

IS are therefore, not only IT, they are distributed across a socio-technical actor network, some actors providing the technological medium (electronic or paper) for handling the information, others, human and non-human for its use and/or as sources of information. Importantly an IS is intrinsic to a network and the actors that perform it and can only be conceptually, rather than actually, separated from its actors' actions. An IS (as opposed to IT) may be appreciated as being the specific activates of human and non-human actors within a network, concerned with the providing, capturing, manipulating and deployment of information. The corollary is; to delineate an IS, whether existing or prospective, entails firstly delineating the network of actors and their collective and individual behaviors facilitated by their structurational 'modalities' of which it is a constituent component. Only then is it possible to identify how, and by whom, the information is captured, stored and flows around the human and machine actors within the network and those who are necessary to the capture, manipulation and provision of the information within that network. Information is also shared by humans face to face as well as facilitated by telecommunication technologies. This is outside the scope of this paper. This focus is with IT facilitated ISs and how they constitute an actor within a network that serves and interacts with the other actors and their structurally mediated behaviours.

How is the structurated actor network represented and the IS distributed throughout it? This is a precursor to moving into the design of the IT that will support it. Firstly it is necessary understand networks: "…whenever you want to understand a network, go look for the actors, but when you want to understand an actor go look through the net the work it has traced" (Latour, 2001). However within the StructurANTion framework, identifying the human and non-human actors and what they do within a network is a necessary yet insufficient description. StructurANTion argues (Atkinson and Brooks, 2004) that the network's capacity for self-maintenance, its autopoiesis, is necessary to that agency. This is manifested within StructurANTion in the 'autopoietic' (Maturana and Varela, 1980) relationship identified by Giddens (Giddens, 1979) as existing between a network's structures and their associated 'modalities', and the humans and machines that draw on them in perpetrating some form of collective agency or interaction with other humanchines. Having identified the heterogeneity of actors and their structural modalities, the next tasks is to identify the representation of their behaviours commensurate with the focal actor's interests. In the case example, the woman patient drives them (ie. the other significant actors in the network) and the relationships they have with each other to address a diagnosis of breast cancer. This enables a migration into the design and development of the IT system commensurate with the other network actors who use it and the information it provides/captures in perpetrating their actions and behaviours.

The central concern, using StructurANTion theory, focuses on the delineation of a technologically mediated IS and its relationship with other actors (human and non-human) within the network. These actors use it to perpetrate some form of collective humanchine agency or conversely provide it with the information it requires. This analysis is intended to act as a precursor to developing the IT and to creating or perpetrating change within an actor network.

From the above discussion, the following three categories of representations of the network are required: *Firstly*, diagrams that capture the actor network in focus, its actors and the modalities of its structurated order. *Secondly*, diagrams which map out the relationship between the human actors in the network and non-human actors. In particular the relationship between the human and actors and the Object-Oriented (O-O) object non-human actors that collaborate and provide informational services to each other within the application and to the other human and other non-human actors in the network. *Thirdly,* the set of diagrams that migrate directly into the application design, while relating back to the actor network (including the IT application). Each set of diagrams are explored in the following sections.

## FIRST DIAGRAMS SET: THE ACTOR NETWORK, ITS ACTORS AND THEIR INTERRELATIONSHIPS

The example is that of a women centred breast cancer surgical decision environment. The original work was undertaken in a UK hospital (Atkinson, 1997). The hospital aimed to procure a hospital wide electronic patient record system. Within the breast cancer surgical unit, it was essential for the new application to be appropriate with their practices. The unit aimed to be woman centred, particularly with respect to treatment decision making and ongoing patient self-management. Any future application would have to be commensurate with this newly emergent structurated order. Here, for brevity, the paper considers only that part of the care process that covers the patient centred decision-making (for more details on the specific case, see (Atkinson and Peel, 1998, Brooks and Atkinson, 2004)). The actors, as well as the patient, include the oncologists and the tests that reveal the diagnostics of the patient condition, the breast counsellor, the protocols and hospital practice guidelines, the surgeon and of course the Patient Clinical Information System (PCIS). All the relationships are all focused on enabling and empowering the woman patient in making her decisions. To understand the network, prior to delineating the PCIS, it is necessary to capture all the actor's and their relationships, not least because they will also be (actor) objects in the

application's functionality (see Figure 2). Having done that it will be necessary to capture the network and actor collective agencies.

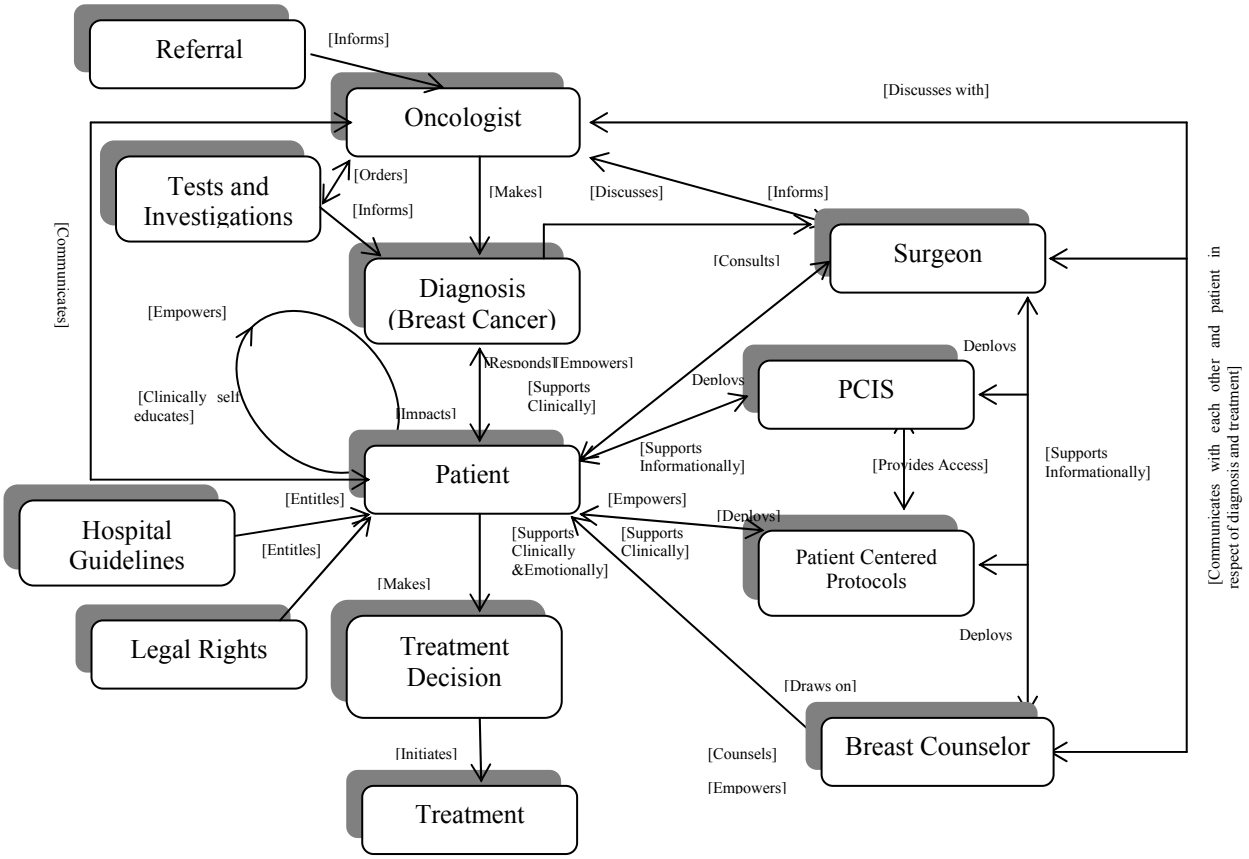



**Figure 2. Actors and Their Relationships within the Patient Centered Breast Cancer Decision-Taking Actor Network**

### Replicating the Network and its Structurated Order within the Patient Clinical Information System Application

The PCIS is a major actor in empowering the patient, through information and knowledge, access and a capacity to allocate resources and authorize other actors along the network to appreciate her requirements in terms of treatment. How then is technology represented? One way would be to identify its hardware and software and explore their parts and programs. This would entail opening up the 'black box' of the technological artifact, to reveal its constituent artifacts. Latour (Latour, 1999) shows that only when an over-head projector (OHP), breaks down does it reveal its parts. However, this is like trying to describe a person only by their bodily constituents, a necessary but not sufficient condition. A more cogent way is to adopt a conceptual language used by those who design and develop IS. The Unified Modeling Language (UML) and Object-Oriented approaches (Bennett et al., 2001, Avison and Fitzgerald, 2002, Satzinger and Jackson, 2003) offer a way of conceptually representing the IS technological artifact's inner workings. It also shows, in the form of Use-Cases, the inner workings of the technology link to external actors, humans and non-humans who use its information services. In addition UML provides a concept of what might be seen as an inner actor, namely the 'object'. The UML object has the capacity to store data internally; but also to provide services and to collaborate with other objects to provide collective services. One object 'the controller' has a direct role in facilitating these collaborations. Another, the 'interface object' is expressly dedicated to interacting with humans and non-humans outside the system. They facilitate the relationship between the systems inner object and the external actors. Such objects are only made manifest by the collaborative workings and behaviors of the systems hardware, software and database actors, within which are inscribed the wider actor network's modalities and its structurated order. These objects are seen here, together with the hardware and software as themselves non-human conceptual and corporeal actors; this paper acknowledges it is against the conventions of UML (who only attribute actors status to those outside the system), but nevertheless, within StructurANTion and ANT they can be attributed the status of 'non-human actor'. In line with the above argument the 'object actors' are identified as constituting the PCIS (see Figure 3). Note how, in this instance, they replicate the other actors within the patient centered breast cancer actor network: apart from the GP who

provides the referral. In other instances some actors will be in the corporeal world but not in the virtual world of the CBIS. This is the first way of delineating the IS of an actor network, through it objects. But this is a static view.

### The Network' Actors, Their Structural Modalities, Individual And Collective Agency

The next StructurANTion framework view of the network identifies the structural modalities of the network as they reside within the heads of the human actors' and are revealed in their actions and are also inscribed within the non-humans and are displayed in their behaviors. Collectively these modalities of signification, legitimization and domination constitute the networks' structurated order.

Table 1 captures the modalities of the patient centered, breast cancer decision making network. Detailed inspection of the modalities reveals how they empower the patient to be the focal actor in the clinical decision making process. Distributed across the network's actors they give her the power, legitimacy and language to make decisions on her own behalf. The modalities of the example's other actors all interact to facilitate this. The next section explores how this structurated order and its actors are instantiated within the computer based PCIS.

Note this does not consider the Emancipatory Structure and its modality of translation, as it sets out only to represent an existing structurated order. Having achieved a representation of the human and non-human actors within the network, the next step is to explore how these actors behave and interact to constitute the network's dynamics.

## SECOND AND THIRD DIAGRAMS SET: THE ACTOR NETWORK, ITS AGENCY AND INFORMATION SYSTEM

Delineating the IS of a network entails a static representation of human and non-human, real and virtual actors in the network and the dynamics of their individual and collective agency and interactions. In this example, a patient responds to a diagnosis of carcinoma breast with a treatment decision. She achieves this with informational support from the PCIS and other human clinical actors. To represent this humanchine dynamic of the actor network and its IS requires a use-case for the PCIS and a model of the whole process enacted by its actors (including an IS component). This paper nominates this model, paraphrasing UML (Satzinger and Jackson, 2003), as an 'Integrated Development Case' (see Figure 4). It is a combination of a Use-Case and a Soft Information Systems and Technologies Methodology (SISTeM) model of the human/machine actor network activity system (for more details on the SISTeM approach see ( Atkinson, 2000)). In this model the use-case of the PCIS information system's services do not show the conventional connection to a single or multiple users (UML human 'actors') but are themselves << included>> within the activities of the patient centred breast-cancer treatment decision-making system, along with its other actors; human and non-human (e.g. clinical protocol). The integrated development case maps out the relationship between the services provided by the PCIS technology and the actor network of which it a part.

A more detailed analysis of the 'include' relationship between the human actors and the UML 'object' actors (see Figure 5) is then carried out. This reveals how the human decision maker actors and the non-human IT system object actors convene together to perform the activities of the breast cancer decision-making actor network. Together, they constitute the actor networks humanchine duality of agency. This entails both the human and the non-human actor working in concert, drawing on the structural modalities of the network's prevailing 'structurated order'. This structurated 'order' is embedded within the humans' minds and, as described here, inscribed within the PCIS machine object's services and collaborations.

The human actors, the PCIS and the other non-human actors within it such as 'protocols' and 'guidelines' acting in concert replicates and reinforces the patient-centred breast cancer decision-making structurated order. This, modality mediated structure/agency duality is exemplified here in the Patient/PCIS joint agency… 'EXPLORE clinical history previous and ongoing conditions, smoking, allergies and medications' (Figure 6). This summary entailed extracting and convening together items from all the diagrams and instruments, expanding the PCIS 'include' network relationship in the form of a UML collaboration diagram (Satzinger and Jackson, 2003) and adding to it their joint agency and structurated modalities. From here, if required, it would be feasible to migrate into the PCIS's design and implementation. If, simultaneously, the hospital changes human clinician and patient behaviors in line with the women-centred structurated order's modalites inscribed within it, to that of patient-centred decision making, then its adoption and enrollment would not only be appropriate and commensurate but more likely to result in a 'successful' and lasting outcome.

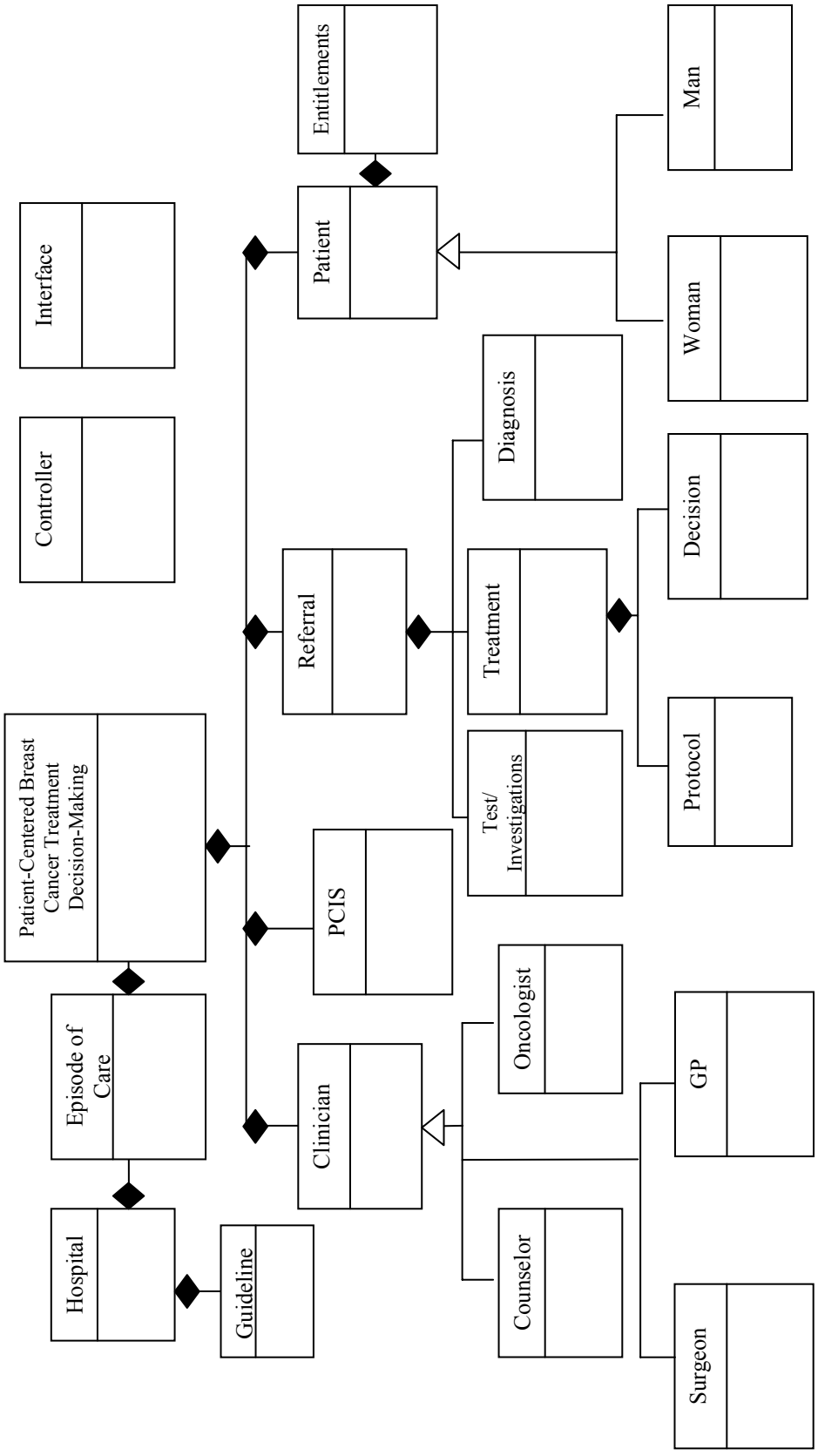



**Figure 3. Whole Part Structure Diagram: Heterogeneous Object Class Breast Cancer Treatment Decision-Making Actors**
**Key: △= part of; ◆ = decision point**

| **Structure** | **Signification** | **Legitimation** | **Domination** |
|---|---|---|---|
| Modality / Actor | Interpretive Scheme<br>*Knowledge Language* | Norm<br>*Rights Obligations* | Facility<br>*Authorization Allocation* |
| Patient (Focal Actor) | Express their insights into their body, fears, concerns and needs using their own language; insights plus information from PPSIS and clinicians | Patient right to take decision on treatment as to what happens to their body. Right to effective treatment in line with decision.<br>Obligated to decide or abrogate to a clinician. | Right to authorize and allocate professional, technical PCIS resources, orchestrating them in line with their decision making on what is their most appropriate treatment. |
| Oncologist | Clinical Knowledge linked with diagnostic expertise skills expressed in clinician's and patient's language | Support patient with diagnosis decision making<br>Access/add patient information with patient in PCIS | Authorize surgeon, allocate theater plus post operative resources; in line with diagnosis, treatment decision |
| Surgeon | Clinical knowledge linked with diagnostic, surgical expertise and skills expressed in clinician's and patient's language | Obligated to support patient in her clinical decision making.<br>Right to disagree and withdraw from caring for patient, while offering alternatives. | Capacity to order clinical human, material and informational resources and the procedures undertaken for treatment |
| Breast Counselor | Clinical knowledge and language about CA breast. Lay language to speak of breast cancer with patient. Knowledge of patient psychology in response to CA and empathic knowledge | Obligated to support the women in her decision making inline with her wishes. Right to speak on behalf of the patient with respect to clinical colleagues, acting as patient advocate | Authorized to empower the patent through the allocation of patient centered skills and resources to enable her/him make decision or abrogate to the surgeon. |
| *Key: Human actor = not shaded. Artifact actor = shaded* | | | |

**Table 1. Patient Centered Breast Cancer Decision Making Actor Network's Structurated Order (part 1)**

## CONCLUSION

This paper has sought to identify how, using StructurANTion theory, humans and non-humans convene together within an organizational system of action and its structurated order. This was done using common tools and techniques, eg. O-O and SISTeM modeling. Moreover, the paper proposes that the humanchine IS can only be conceptually delineated from that organization for the purpose of technology design/development. An IS is a property of an organizational humanchine actor network, enacted by its actors, drawing on its structurated order. Given that existing development methodologies do not (yet) adopt this perspective, they are unable to provide adequate representation. This paper explored how it might be possible to use StructurANTion to delineate an actor network's IS, not as something apart from the organizational actor network, but as an intrinsic dimension of it. Realizing an IS encompasses not only the technology and the application but developing and changing the organizational actor network. Only then can its IS be developed.

| **Structure** | **Signification** | **Legitimation** | **Domination** |
|---|---|---|---|
| Modality / Actor | Interpretive Scheme<br>*Knowledge Language* | Norm<br>*Rights Obligations* | Facility<br>*Authorization Allocation* |
| Referral | Patient/GP referral in patient & clinical terms | Initiate process of care; appropriate referral | Authorize and allocate clinicians and resources |
| Diagnosis CA Breast | Expressed in a way understandable to the patient, in current clinical terminology. | Medically cogent diagnosis, commensurate with patient's expressed requirements | Allocates appropriate clinical resources. Authorizes clinical personnel for diagnosis |
| Patient Clinical Information System (PCIS) | Provides clinical information to patient (and clinician) about themselves, condition and treatment in appropriate lay and professional languages | Has the right, or authority, and obliged to provide information, in format and content, appropriate to patient and clinician. | Allocate clinical information to patient and clinicians. Authorized to facilitate communications between patient and clinicians via PCIS & notes |
| Patient's Treatment Decision | Signifies, in lay and clinical languages what is needed to be undertaken to address patient's diagnosis | Give patient the right to make treatment decisions to meet her diagnosis | Allocates resources and information necessary for patient to address her treatment decision; authorizes access to clinical expertise. |
| Patient Centered Protocols | Support of patient clinical decision making on treatment commensurate with effective practice treatment | Enshrines the rights and obligations of patient and clinician necessary for diagnosis and treatment | Allocates resources and authorizes clinical personnel to realize the patient's decision on treatment |
| Hospital Guidelines | Clinician practices that a patient can expect from a clinician, in lay and technical language | Rights and obligations of patient and clinician regarding treatment and services. Hospital legitimized | Provides framework to guide patient in allocation of resources and authorization of personnel |
| Legal Rights of Patient | Sets in lay and technical language the rights of the patient regarding diagnosis and treatment | Identifies patient and clinician expectations of legal rights within clinical practice. Enshrined in the constitution. | Specify resources, personnel and artifacts the patient and clinician can draw on in protecting their rights under the law. |
| Treatment* | Description of treatment and how it will be achieved, in lay and clinical professional terms | Specify rights and obligations of humans and artifacts undertaking treatment to address the patients diagnosis | Allocates physical and authorizes human & professional resources to 'materialize' patient treatment decision |
| *Key: Human actor = not shaded. Artifact actor = shaded* | | | |

**Table 1. Patient Centered Breast Cancer Decision Making Actor Network's Structurated Order (part 2)**

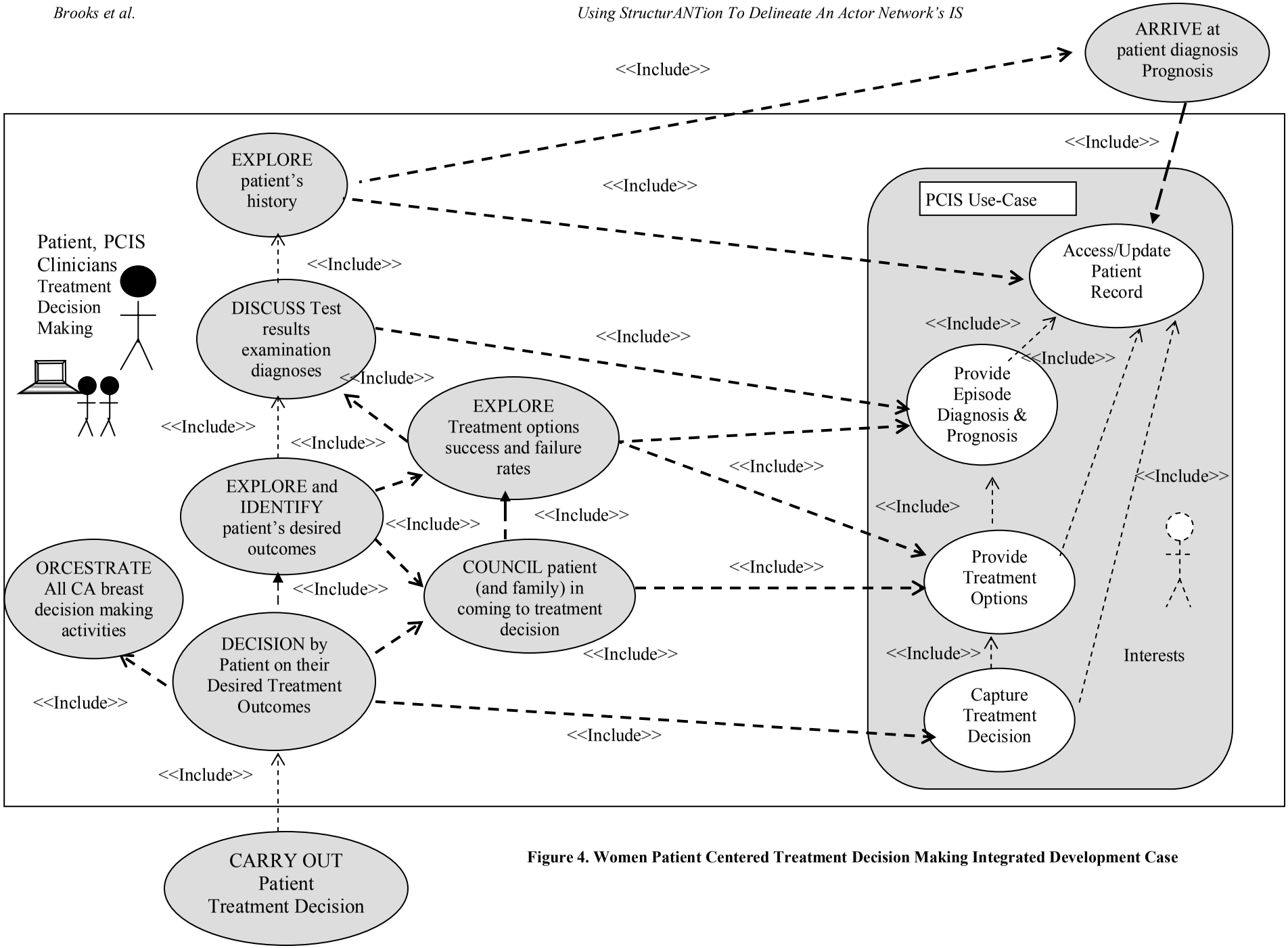



**Figure 4. Women Patient Centered Treatment Decision Making Integrated Development Case**

| 1<br>**Human & Machine Actors**<br>(Table 1) | 2<br>**Agencies of cancer treatment decision-making actor network** (Fig. 1) | 3<br>**'Object' Actors within the PCIS**<br>(Fig. 3) | 4<br>**Services Provided by PCIS' Actor Objects**<br>(Actor Object(s)✓)<br>(Actor collaborations and services* in the PCIS) |
|---|---|---|---|
| *Patient*<br>*Surgeon*<br>*PCIS* | EXPLORE jointly, history previous and ongoing conditions, smoking, allergies and medications | Patient✓<br>Patient &Clinician<br>Oncologist<br>Controller | - *Provide PCIS Patient's Health Record**<br>- *Provide Current Diagnosis and Prognosis*<br>- Provide access to patient legal and -human rights with respect to treatment choice.<br>*Note Controller facilitates all Inter/Intra-actions* |
| *Patient*<br>*Surgeon*<br>*PCIS* | EXPLORE jointly chronic conditions ongoing treatments and diagnosis implications | Patient<br>Patient Diagnosis | - *Provide Health Record to Patient Surgeon*<br>- Provide confounding factors for current diagnosis ongoing treatments and/or conditions |
| *Patient*<br>*Surgeon*<br>*Counsellor*<br>*Diagnosis*<br>*PCIS* | DISCUSS jointly patient condition, test results, examinations, diagnosis, and prognosis<br>Human/Machine Integrations | Patient &<br>Tests<br><br><br>Tests<br>Patient & Tests<br>Patient | -Provide patient X test results, including biopsies, mammograms, fine-needle aspiration, x-rays, bloods/urine analysis, node count calculated genetic risks, ramifications<br>- Access Test Ordering Protocols/Reporting<br>- Provide commentaries on results and their significance labs and pathologists to patient<br>- Provide Diagnosis and Prognosis for current episode including risk metastases reoccurrence. |
| *Patient*<br>*Surgeon*<br>*Counsellor*<br>*PCIS* | EXPLORE together potential treatments/ options against diagnosis/prognosis, success rates and risks | Treatment<br><br><br><br>Treatment | - *Provide Guidelines/Protocol treatment options, success rates, and risks and appropriate combination of treatments: lumpectomy or mastectomy, reconstruction, chemo and/or radiotherapy and/or adjuvant drug treatment*<br>- Provide visual simulations of treatment options |
| *Patient*<br>*Counsellor*<br>*Treatment*<br>*PCIS* | COUNSEL and SUPPORT patient (and family) in coming to a treatment decision | Treatment<br><br>Treatment | - *Access visuals/simulations of treatment outcomes*<br>- Access database of patient support groups<br>- Provide other patients affidavits/experiences |
| *Patient*<br>*Surgeon*<br>*Counsellor*<br>*PCIS* | EXPLORE and IDENTIFY patient's desired outcomes | Treatment &<br>Hospital<br>Patient<br>Clinician | - *Provide hospital/Surgeon comparative performance on breast care diagnosis/treatment*<br>- *Capture Patient's desired outcome from the procedure* |
| *Patient*<br>*Surgeon*<br>*Counsellor*<br>*Treatment*<br>*PCIS* | DECIDE, by patient, treatment for symptoms diagnosis and prognosis | Treatment &<br>Protocol<br>Patient<br>Patient &<br>Treatment<br>Patient & Hospital<br>Patient Surgeon | -Provide patient-centered treatment decision support protocol/guide lines<br>- Capture decision protocol compliance/variance<br>- Capture patient treatment decision, primary and adjuvant<br>- Capture patient and Surgeon sign off<br>- Book next appointment or place on ward or outpatients<br>- Update current patient episode notes. |
| *Patient*<br>*Surgeon*<br>*Counsellor*<br>*PCIS* | ORCHESTRATION treatment decision-making activities | Patient<br>Patient<br>Patient Surgeon | - Capture decision protocol compliance<br>- Provide access to current episode patient notes<br>- Capture patient and clinician comments on decision-making process. |
| *PCIS* | PROVIDE patient physician information | All objects<br>Controller | All Object Service Activities delineated above<br>*Note Controller facilitates all Inter/Intra-actions* |

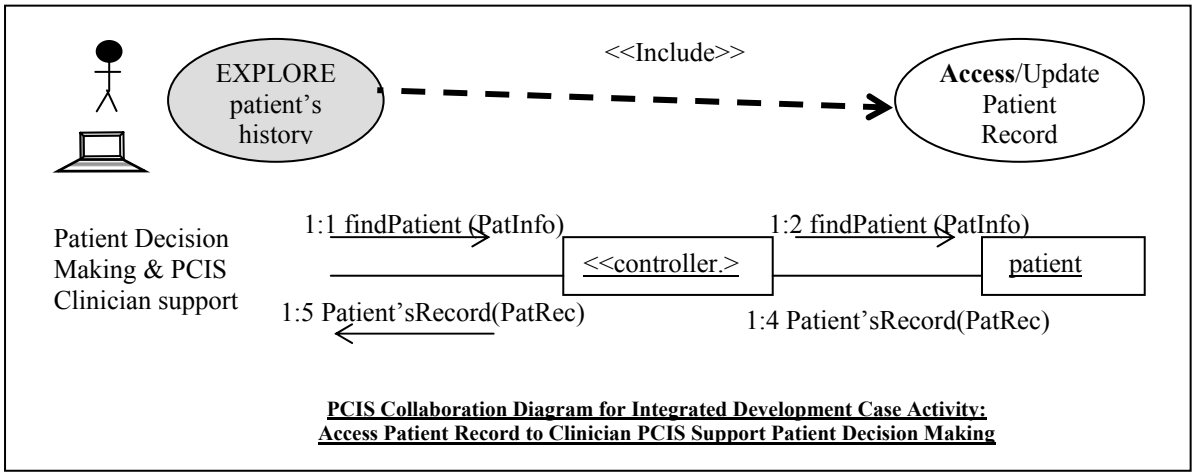
**Figure 5. Actor 'Include' Inventory: The Information Systems Representational Instrument 'Patient Centered Cancer Treatment Decision-Making Actor Network'**

| Structure | Signification | Legitimation | Domination |
|---|---|---|---|
| Modality / Actor | Interpretive Scheme<br>*Stocks Of Knowledge* | Norm<br>*Rights Obligations* | Facility<br>*Authorization Allocation* |
| Patient<br>(Focal Actor) | Expressions of their insight into their body, fears concerns and needs using their own language and insights as well as information from PPSIS and clinicians | Patient right to take the decision on treatment as to what happens to their body. Right to effective treatment in line with decision.<br>Obligated to decide treatment or not or abrogate it to a clinician. | Right to authorize and allocate professional and technical PCIS resources, orchestrating them in line with their decision making on what is for them the most appropriate treatment. |
| Patient Clinical Information System (PCIS) | Provides clinical information to patient (and clinician) about themselves, their condition and treatment in the appropriate lay and professional languages | Has the legal role and obligation to provide information to patient and clinician in formats and content that are appropriate to both. | Allocate clinical information to the patient and clinicians. Authorized to facilitate communications between patient and clinicians via PCIS& Notes |
| *Specific Agency*<br>PCIS patient record modalities | Provide patient's referral, clinical record and history in both lay patient and clinical professional languages and concepts, images & vocabulary | Obligation to provide patient with her up-to-date record when formally requested. Legitimated to provide patient with her record and her nominated clinician | Allocates record to the patient<br>Authorizes the patient and nominated clinician to access record for clinical decision making |

**Extracted From Patient Centered Breast Cancer Decision Making Actor Network's Structurated Order**

| **1**<br>**Human & Machine Actors**<br>(Table 1) | **2**<br>**Agency of cancer treatment decision-making actor network**<br>(Fig. 1) | **3**<br>**UML Object Actors within the PCIS**<br>(Fig. 3) | **4**<br>**Services Provided by PCIS' Actor Objects**<br>(Actor Object(s)✓)<br>(Actor collaborations and services* in the PCIS) |
|---|---|---|---|
| ***Patient PCIS*** | EXPLORE clinical history previous and ongoing conditions, smoking, allergies and medications | **Patient✓ Controller** | **- Provide PCIS Patient's Health Record*.**<br>**- Facilitate interactions with/within PCIS** |

**Extract from Actor Inventory and Information Systems Representational Instrument**
**'Patient Centered Cancer Treatment Decision-Making Actor Network'**




**PCIS Collaboration Diagram for Integrated Development Case Activity:**
**Access Patient Record to Clinician PCIS Support Patient Decision Making**

**Figure 6. Combining Human/Machine Agency and its Structurated Modalities**

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14