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# THE ROLE OF THE EMANCIPATORY STRUCTURE IN STRUCTURANTION: INFORMED INFORMATION SYSTEMS DEVELOPMENT

*Alternative Approaches to Information Systems Development*

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## Abstract

*This paper illustrates how the Emancipatory Structure within the StructurANTion theoretical framework may be called on by human and non-human actors to evoke radical change, even of the dissolution and replacement, of a humanchine network. This paper discusses the case of breast cancer surgery and the role information systems and technologies play in enabling this radical translation of an existing clinician-centric network to one in which the patient (female or male) rather than the clinician is the focal actor. The tools and techniques used to represent such informed networks and their emancipatory translations are also illustrated.*

**Keywords:** StructurANTion Theory, change, Structuration Theory, Actor Network Theory, emancipation, health informatics

## Introduction

“Patient choice: Giving patients more choice about how, when and where they receive treatment is one cornerstone of the Government’s health strategy.”

Department of Health (<http://www.dh.gov.uk/PolicyAndGuidance/PatientChoice/fs/en>)

“Some women with breast cancer want to be involved in and do participate in making treatment decisions. They tend to be more satisfied with their choices than those whose roles are less active or more active than they desire...”

(Keating et al. 2002)

This paper builds on previous work undertaken into the StructurANTion (Figure 1) theoretical framework and its relevance to information systems (IS) research and its application to IS practice (Atkinson and Brooks 2006; Atkinson and Brooks 2003). StructurANTion provides an ontological description of the world, one with a view of information systems that moves away from the prevalent ideas of an information technology and its human ‘user’. In its place it posits an image of an information system as being a property of sociotechnical networks of humans and non-humans that persist and incrementally change as a result of Giddens’ process of ‘structuration’. (Giddens 1984b) StructurANTion, however, extends Giddens’ ideas on incremental change and adds the concept of Emancipation to accommodate occasions of dramatic change. The Emancipatory structure, when evoked by an actor, can initiate and

effect a fundamental transformation of a ‘humanchine network’ (and inherent structured order), including its use of information. This has not been done in previous papers (Brooks and Atkinson 2004) on StructurANTion. The nature, role, and development of information systems and technologies within this evocation process and its outcome are the subject of inquiry here.

Until recently this theoretical framework has been used to investigate how such humanchine networks persist and change: both as an outcome and a necessary condition of the human agency and non-human actors’ behaviors (i.e., information systems and technologies (IS&T)) and the resulting constitution of the structured ‘humanchine’ network. In this paper, the focus shifts to how a new network arises out of fundamental changes to humanchine networks through the evocation of the Emancipatory structure. The motive behind this research is to both create a theoretical framework and lay down a vocabulary, both scriptural and visual, along with representational tools and techniques for representing the informed ‘humanchine’; some new but other drawing on UML (Bennett et al. 2001) and SISTeM sociotechnical systems modeling (Atkinson 1997b). The intention is to create a practical approach, as well as underpinning research into the creation and nature of informed networks of people and (information) technologies that, together, exhibit concerted agency for some defined purpose.

These ideas are illustrated in a United Kingdom (UK) hospital based case study, in which a clinical team, in association with patient representatives, sought to reconfigure clinical processes as well as change the culture and the power arrangement within a breast cancer surgical unit. This is seen through the evocation of the networks’ emancipatory structure toward the, predominantly, women patients as being the focal actor, rather the clinician (in the guise of the Consultant Surgeon); overall, this resulted in a change to the networks’ structured order. This paper begins with an overview of the StructurANTion framework:

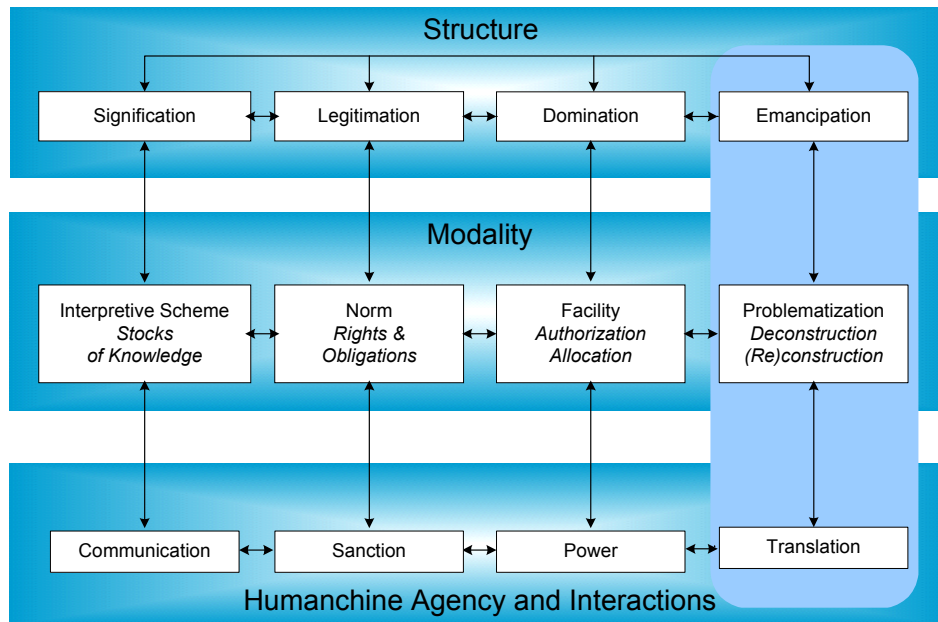
## **The StructurANTion Framework**

The StructurANTion framework, as the name suggests, is an amalgamation of the Structuration Theory (ST) of Anthony Giddens (Bryant and Jary 1991; Giddens 1976; Giddens 1979; Giddens 1984a; Giddens 1984b; Giddens 1991a; Giddens 1991b) and the ‘traditional’ form of Actor Network Theory (ANT) (Latour 2005). StructurANTion Theory was originally posited as a theoretical framework that could underpin enquiries into the nature of information systems (IS) and their development that went beyond the stereotypical concept of them as being constituted of an information technology (IT) and its (human) ‘user’. Traditionally the computerized IT was seen as the dominant partner and the human user constituted its ‘Other’. The choice of ANT was made to accommodate the person and the technology in a single framework, to replace the machine-human duality with the hybridic humanchine actor and network. The justification and basis for this humanchine duality was based on a reference to Giddens with respect to whom or what are causal agents. He says: ‘To be human is to be an agent – *although not all agents are human.*’ (emphasis added) (Giddens 1985). From this we infer that information technologies can, alongside humans and other non-humans, be actors or ‘agents’. This does not imply that non-humans exhibit intentionality. Rather they behave within parameters inscribed in them and in response to a prescribed range of stimuli that arise out of their environment, from both humans and non-humans, e.g. a keystroke or password from a human, or message package address from a remote server. Such inscription can occur at manufacture, in the case of IT, when programmed and built, and further at their implementation or through an upgrade through the addition of further functionalities and subsequent provision of further services.

Structuration Theory accounts for how the human individuals and the non-human software/hardware constitute the humanchine network that exists and persists everywhere, as in organizations and in the widest sense what is termed the ‘Sociotechnicalété’ (the term ‘sociotechnicalété’ combines the technical with the French ‘société’. It is intended to replace the wholly human society with that of the sociotechnical ‘society of the humanchine’). The former ranges from a small company to national governmental bureaucracy, from multinationals to incidental groupings – for example, blogs, Internet chat-rooms.

Within the StructurANTion framework (see Figure 1), a structured network’s persistence is an inherent property of the humanchine dualities that constitutes it. While a ‘focal actor’ may have translated the actors initially into a network, its continued ontological persistence is due to the inherent structuration cycle linking actor agency to the network through its structural modalities. The majority of networks in the real world persist not as result of a single exercise, or the indeed repeated exercises of the will by some form of focal actor, but of humans and non-humans acting in concert, working together through mutuality and custom, having an inherent legitimacy in their roles within the network, with a shared common language, common world view (Weltanschauung), and often some form

of reward for their labor (in an organizational context). This is not to say that there aren't disparities or exercises of power in a network by its actors (human and non-human) toward each other or toward other networks and their actors. Giddens (1979) identifies the ability to authorize other person's actions and allocate resources as the outcome of an actor or actors having and deploying power within a network and/or toward other networks and their agency. Note that both human and non-humans exhibit a capacity for the exercise of power.



**Figure 1. The StructurANTion Framework**

As can be seen from Figure 1, within the StructurANTion framework each humachine network possesses a structured order. Giddens specified three identifiable structures, those of Communication, Legitimation, and Domination (Giddens 1976; Giddens 1979; Giddens 1984b). Structures are both formed out of and, in turn, enable human and non-human machine actions and interactions. This is achieved through the mediation of each of the structures' associated modalities. These modalities consist of: Stocks of Knowledge to enable Communication, Norms that enable Sanctions to be set on the actor's actions and interactions, and power as manifested in the Authorization of other human's actions and the Allocation of non-human, machine behaviors. Humans and non-humans draw on these inherent and/or internalized structural modalities when perpetrating their acts; in so doing, they recursively (re)constitute the humachine network over time and space. The structure, modality, and agency cycle that constitutes society is akin, as Giddens sees it, to the self replicating process known as autopoiesis (Maturana and Varela 1980).

Signification (S)	Legitimation (L)	Domination (D)		Emancipation (E)
Symbolic orders/modes of discourse Cultural	Law/modes of sanction Legal	D(authorization)/human Agency Command	D (allocation)/nonhuman behavior Deployment	Translation Humachine Transformatory Praxis
[S-D-L]	[L-D-S]	D (auth)-S-L	D (alloc)-S-L	E-D-L-S

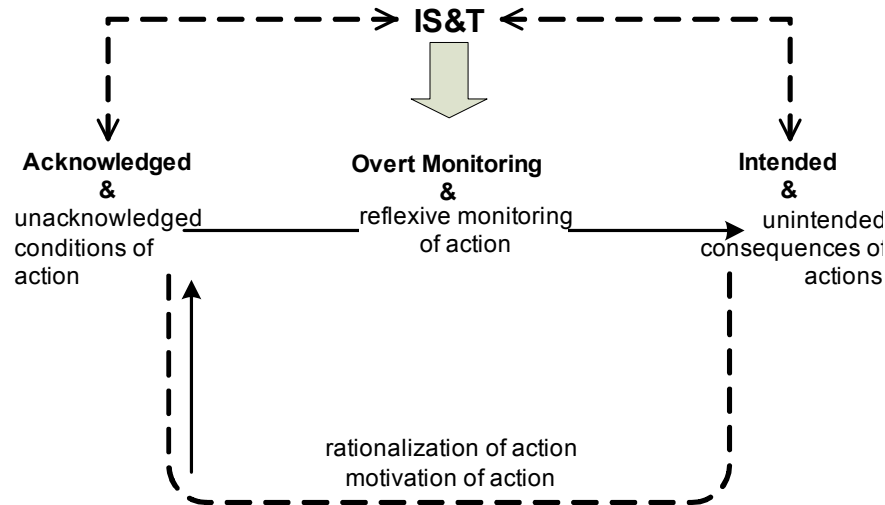
**Figure 2. Structuration Organizations and Emancipation (Modified from Giddens'(Giddens 1981; Giddens 1984b) Model of Structured Institutions)**

The institutions of a society (see Figure 2), such as cultural, political, and economic, together with the legal system have structured orders in which one structure (in association with the others) is predominant. For example, the Legal system depends predominately for its effect in practice on its social Legitimation; people internalize and accept the law and obey it without continual reference to it or those who police it. Only when it is transgressed is Dominatory power called upon by the State and its outcomes symbolically Significated through the courts as sanctions are applied. Equally, businesses sanction employee's behaviors through access to promotions and levels of status. Resources are also allocated or withdrawn, depending on whether the group is in or out of favor. Unionized labor often calls on the emancipatory structure when in dispute with their employers and ambitious senior employees who wish gain to power and status by overthrowing the existing system.

Humans, usually unconsciously, and sometimes overtly, reflexively monitor their own and other humans' actions and modify their behavior in response (see Figure 3). In addition, they reflexively monitor non-human actors' behaviors too. A major component of this reflexivity is their monitoring of their own responses to other humans and non-humans actions and behaviors, for example when driving their car and monitoring its instruments while simultaneously monitoring the behaviors of other cars and their drivers.

Under many circumstances when this reflexivity is overt, humans and non-humans also draw systematically and openly on the information provided by other information systems and technology actors – the monitoring of the state of an atomic reactor for example, the reading of pop ups that warn of an impending meeting on a PC. In response to this overt and covert reflexivity of the behaviors of themselves and others, humans adjust their own actions and also influence the actions of other humans and non-humans. If necessary they may also seek to change the behaviors/functionality of non-humans, such as information systems.

The outcome of this reflexivity is that the modalities of the structures of the humachine system are both maintained, synchronically (i.e., at the same time), and also changed, diachronically (i.e., over time). This then changes the structured order and the settings of the human's socially distributed modalities that, in turn, underpin the socio-technical humachine systems new actions. However, as yet, non-humans (computerized machines) do not have this innate reflexivity, though they often provide by design (but without intention) the information necessary for humans to be reflexive. The structured order are initially inscribed in the machines (i.e., information technologies) in the form of modalities at their design and manufacture stages and remain fixed as a result. That is unless they can be adjusted or reengineered through a wide range of humachine intervention: from application upgrades via the Internet to many hours of rewriting code or large scale procurements; this may change in the future when self-reflexivity, and a capacity for learning from contingencies, can be engineered into non-humans (although this in itself may be more complex and difficult to accomplish as 'quick fixes' are rarely that quick to carry out, while the expectation that what is not 'hardwired' in the system can be easily and continually changed may also be unrealistic).



**Figure .3 Giddens' Structural Reflexivity and the Role of Information Systems and Technologies in it (modified from (Bryant and Jary 1991) citing (Giddens 1981; Giddens 1984b)).**

Humans within a network may have to adopt new behaviors so as to incorporate the fixed modalities and functionalities inscribed in the non-human machine when they are translated into a network. This, in turn, effects changes in the modalities of the network into which the technology is translated. The existing humachine network may, through their interactions, also create agency not anticipated at the manufacturing or development stage of an information technology. This causes changes in the network's modalities.

To date, technologies within a networks' structured order, unlike humans, are non-reflexive with respect to overtly or tacitly adjusting their behaviors in response to the behaviors of the other actors within the network and/or to the external contingencies impacting upon it from other networks. However, some machines in a network (through their inherent programmed capabilities) may change their behaviors in a reactive response to a prescribed set of external and/or internal disturbances or stimuli. Such cybernetic feedback loops in technological systems are commonplace with respect to their responding to functional breakdown. But even this cybernetic feedback is carried out within the parameters and algorithms programmed into their functional modalities, as they reside within the aegis of the networks' existing structured order: into which an information technology have been translated via its implementation. A prime example of human dependent reflexivity in technologies is the constant upgrades software need to protect themselves against viruses and adding functionality (today downloaded via the Internet).

From within the StructurANTion framework (Atkinson and Brooks 2005) an information system is defined as: *an amalgamation of the activities and behaviors of human and nonhuman technological actors across a structured humachine network concerned with the capture, storage, manipulation, provision, interpretation, and deployment of information (digital and/or analogue), by its humachine actors in their interactions and pursuance of individual and collective agency as networks across their time and space*

The corollary of this is that information systems development becomes (Atkinson and Brooks 2005): *the (re)creation across structured humachine networks, of an effective capacity for the capture, storage, manipulation, provision, interpretation, and deployment of information as a component of its human and non-human actors' actions and interactions in their perpetration of individual and collective agency as organizations or the wider sociotechnicalité.*

New information systems applications and technologies when translated (i.e., implemented) into an existing network can, as a result of their inherent potentialities, disturb and change its existing structured orders. The mainframe computer, the mobile phone, the PDA, and lately the BlackBerry have all had a dramatic effect on how business is conducted and organizational success. This is because both the technology's inherent functionalities and those that arise from their synergistic relationships with other human and non-human actors in the network. However, over time, the modalities and functionalities built into a technology being fixed give rise to the effect of 'modality drift' or even 'rift' as those of the humans in the organization naturally change (through reflexivity) while theirs do not.

This occurs as a result of the networks' activities and structured order shifting naturally over time due to the changes in ongoing human agency and interactions within the organization.

The technology's functionality does not keep synchronized with the changes in human behaviors associated with changes in business practices and products, government legislation, or organizational restructuring. As a result of these changes in the organizations' structured order and human agency, the information technology finds itself clashing with the organization/society (unless the technology can be easily upgraded or replaced). This can lead to major problems for the organization, affecting its performance and creating a rift within its culture. Modality rift can occur at the very instance when the technology is translated into an existing network. This was a major issue in the adoption and use of an organization wide ERP system (Holland et al. 1999; Wagner and Newell 2004; Wagner and Scott 2003) in its implementation into an organizational humachine network. Its introduction had the effect of unbalancing the organization and the existing structured order. The ERP was intended facilitate the increase of power and control to the corporate centre by providing access to information at the periphery and up the managerial spine. In this case of the Ivy University, this drew resistance from departmental administrators and accountants. The ERP challenged their incumbent privileged, powerful, independent positions within the University's incumbent Structurated order by moving power and control over resources and information to the centre. The departmental administrators used their own applications to manage their own resources while providing limited information to the centre. Together with a not very effective implementation of the ERP, it enabled them to stave off the 'machinations' of the University Vice President. This, in turn, led him to eventually resign and a retrenchment of the incumbent structured order. The VP had evoked the power structure, but had failed to translate the actors of the University network, particularly the ERP, in line with his own interests through an effective use of that power. The ERP, in StructurANTion terms, had betrayed him as a 'machine machination' for achieving control over the budgetary resources, who was able to use them and for what purpose, under the existing structured order. Giddens' concept of recursivity between human, and (in this case) technological, agency and structure, mediated by a humachine systems modalities, have been used to explore persistence and gradual change. But what of episodes within that humachines' network lifetime where major disjunctions, even death and rebirth, occur. It is proposed here that another structure exists to facilitate such changes, namely Emancipation.

### ***The Emancipatory Structure***

Emancipation is identified as a structural property of the sociotechnicalité formed out of the same humachine system/agency-modality-structure cycle as Giddens' original structures of Communication, Legitimation, and Domination and their respective modalities of Stocks of Knowledge, Norms, and Facility. However, unlike the latter that are constantly being evoked in the course of human actors' everyday actions and interactions, the Emancipatory structure places an 'epoché' (or momentary stop) on this everyday world, the 'lebenswelt' (or lifeworld), of the individual actor and their humachine network. It enables a putative human 'focal actor' to step back from it, to bring it from the unconscious level to the conscious level, then, where appropriate, to create a completely new network. By drawing on its modality of deconstruction, the focal actor seeks to dismantle the existing network and its incumbent structured order and to then, in turn, to seek to reconstruct a new humachine network in its place. The latter necessitating this putative focal actor in accruing of power over other actors, establishing their legitimacy in this role, and their amassing of knowledge and the necessary language.

In the case of the machine, or rather the 'non-human' within the network, while they have no 'will' as have humans, they nevertheless have the capacity to evoke in their human partners within a network a sufficiently enough strong reaction to a particular phenomenon such that the latter problematizes the everyday world of the humachine network and seeks to change it. For example, a clinical audit application picks up abnormal reactions to a particular procedure or medication by a certain class of patients; an act of Parliament decriminalizes certain human behaviors. All non-human actors can be said to act by proxy through functionality inscribed in them or, through displacement, in their effects on to humans rather than as a direct 'exercise of their will', expressed as intentional agency. As with human action, the actual responses engendered in others by non-human and humans alike is not prescribed but situated by the conditions under which their agency occurs, including an existing or prospective network and its structured order.

When evoked by a 'seeking-to-be' focal actor, the Emancipatory structure initiates a process of either overtly or sometimes covertly challenging the existing humachine network and its incumbent structured order. The intent behind such an evocation of the Emancipatory structure, however, is not a nihilistic wish to destroy the existing humachine network for its own sake or to marginally change its agency in some way. Rather, it is to seek to make a

problem of it and as a result deconstruct and supersede it altogether, replacing it and reconstructing a new humanchine network in its place with a new focal actor.

Evoking the Emancipation's modality is comparable, and compatible, with the traditional ANT processes of Problematization of a real world situation (Latour 2005). They both manifest themselves as a form of agency by actors following the partial or complete deconstruction of an existing network and its structured order and the subsequent reconstruction of a new humanchine network in its place. Sometimes the intent behind the evocation of the Emancipatory structure's modality is to deliberately replace the incumbent with a new network; other times it is to simply deconstruct the incumbent network altogether. The former manifests itself initially in the real world as the 'traditional' ANT process of network formation of the actors, at the prompting of a 'focal actor' and subsequently migrating through the moments of translation namely: problematization, intéressement, enrolment, and mobilization. If successful, the result is the emergence of the new humanchine network with its own, initially fragile, structured order. As Giddens (1979) points out, it is a process replete with the exercise of power, ranging from covert to overt conflict.

This section has provided an introduction to the StructurANTion theoretical framework. The authors' legitimation of what, to some, may appear to be a cavalier use of both these theories in order to not only facilitate inquiry but underpin praxis and in turn inform theory can also be seen as Giddens' own concept of the double hermeneutic. He defines this as: 'a mutual interpretative interplay between social science and those whose activities compose its subject matter' (Giddens 1984). 'Why strive for knowledge' he says 'if that knowledge cannot serve us in life.' StructurANTion, here, is not aimed solely at facilitating explanation, rather, at both continuation and transformation.

The next section presents a health-based case study to illustrate this framework. The focus is on the role of information systems in the evocation of the Emancipatory structure within a breast cancer diagnosis and treatment network.

## **The Role of Information Systems in the Evocation of the Emancipatory Structure**

As explored above, there are two forms of change occurring in a Structured Humanchine network. The first form is that of incremental change: change over the lifetime of the network. This change in the network (or the wider sociotechnicalité) is driven by the almost unacknowledged processes of internalized reflexivity, occurring within individual humans as they act and interact. It manifests itself firstly in the micro adjustments in individual human behavior and secondly as the accumulation of the slow, but incessant, changes occurring, virtually without notice across organizational networks, such as the wider national and even global sociotechnicalité. Such change, except in times of revolt or war, while virtually undetectable in their local effects, is omnipresent. Only with hindsight is it observable in any detail. Technologies often speed up processes of change within the sociotechnicalité by orchestrating and enhancing existing practices, but nevertheless this form of change is still not overtly revolutionary in nature; rather it is a manifestation of reflexive yet unconscious processes of humans melding with new forms of technology, mediating their interactions more effectively as a result. This is not to say that such change over the long haul cannot be profound. The emergence of capitalism since the late 18<sup>th</sup> and early 19<sup>th</sup> century, and the central role of non-human technologies within it, has had a profound role as actors within the emergence of the globally dominant capitalist/market structured order. More recently, the Internet, close orbit satellite networks and sophisticated PDAs are prime examples of non-human actors impacting dramatically upon and moving the 21<sup>st</sup> century into a global sociotechnicalité.

The second form of change proposed here, as occurring within humanchine networks, is that of a much more overt nature. Such overt and often dramatic change occurs when individuals or collectives, such a political parties and movements, companies, and entrepreneurs and even radical or criminal individuals and groups seek to overtly or covertly problematize the incumbent network and its inherent structured order with the aim of overthrowing and replacing, rather than replicating, it. This entails deconstructing the structured orders of the existing humanchine network and, indeed, of the local organization or wider sociotechnicalité. Organizations of all kinds, large and small, national and multinational, commercial and non-commercial, private or public, political or pressure groups are all subject to this form of overt change. This second form of change, or rather transformation, occurs when the stability in the networks structured order is suddenly punctuated by short, intense, dramatic dislocations or even deconstructions, which occur when individuals, groups or political parties evoke the emancipatory structure, out of which emerge new humanchine networks with radically different incumbent structured orders, characterized by



shifts of power, from that of the previous network. Once this occurs and the old network is deconstructed and new humanchine network (re)constructed in its place, then a relatively stable period for the network again arises.

Radical evocations of the Emancipatory structure occur relatively infrequently in whole societies. In companies and organizations, however, evocations of the Emancipatory structure are far more prevalent and, indeed, overtly pursued by ambitious members of the managerial hierarchy. For example, IBM's (virtual) abandonment of a structured order formed around the building and selling of computer technologies, one that has sustained it for decades, and its replacement with consultancy business with a structured order aimed at promoting and pursuing a new structured order in the wider sociotechnicalé identified as... 'A digital revolution, led by continuing advances in IT, and an Internet revolution, born of open standards,' is begetting a business process revolution. It, in turn, is creating conditions for a "perfect storm" of collaborative innovation with the potential to restructure individual enterprises and entire industries, perhaps even entire economies' (Wladawsky-Berger 2006).

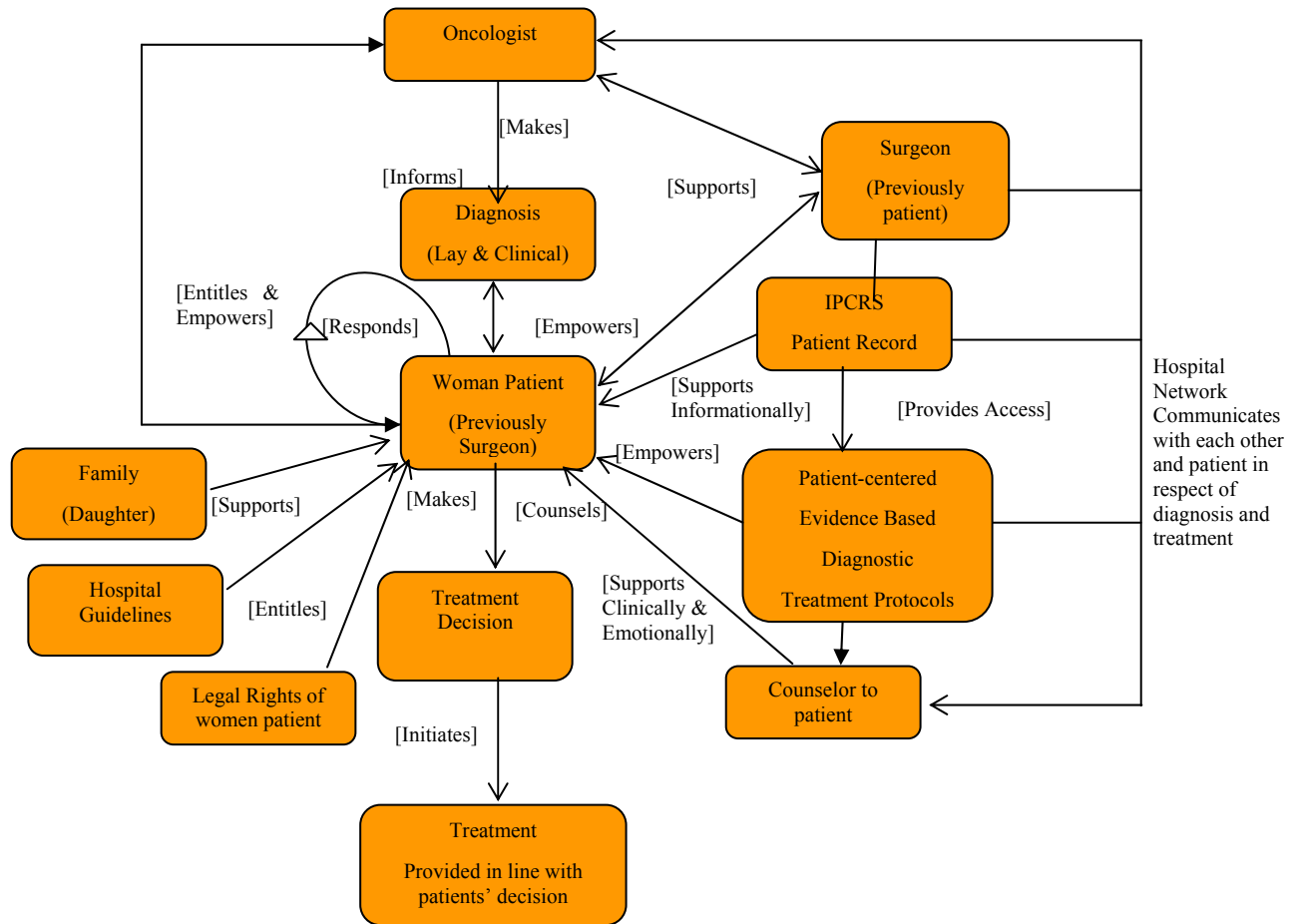
Drawing on the StructurANTion framework, organizational humanchine networks start with a localized problematization, such as that of IBM above, and, through a process of evolutionary development punctuated by a series of dislocating translations, grow into networks that can span the globe. Such networks (for example, the Internet, a profession, a multinational corporation) may come into being and grow subsequent to their emergence without any overt single focal actor driving them. Others, such as Virgin Corporation, grow directly as a result of the drive of its focal actor creator, i.e., Richard Branson. Once established, these networks then keep going without the direct guidance of a focal actor, through their inherent self-creating 'autopoietic' processes (Maturana and Varela 1980).

## **Case Example - Evoking the Emancipatory Structure: Patient-Led Breast Cancer Decision Making.**

In previous research into the nature of the electronic patient record (EPR) an actor network was delineated that put the patient at the centre, as its focal actor (Atkinson and Brooks 2003). However, it did not account for how, through what is argued here as the evocation of StructurANTion's Emancipatory structure, such a network became, structurally and informationally, self-sustaining and why it did not revert to one where the clinician makes all the decisions. We will also show the processes, tools, and techniques involved in deconstructing an existing humanchine network, its structured order, and its replacement with another.

Berg succinctly delineates the clinical process itself as an actor network when he says: '... I conceptualise medical practices as networks of heterogeneous elements (including physicians, patient files, and x-ray machines) - elements which are interconnected in manifold ways and which, taken as a *whole*, constitute the workplace...' (Berg and Bowker 1997).

The patient-centered breast cancer decision making humanchine network can be seen in Figure 4. This women-centered breast cancer treatment network, as opposed to a clinical surgical consultant lead network, has come about within this UK hospital as a result of patients and certain senior clinicians evoking the network's Emancipatory structure. They did this by problematizing the prevailing networks' structured order as being overtly surgeon centered and not wholly (if at all) taking into account the patients' wishes with respect to her choice of treatment and access to information that had the potential to support these choices. The problematization was initiated by patient representatives and through a change of culture within the clinical team, itself spearheaded by a senior surgeon. This problematization of the networks' structured order was in response to pressure from within by nursing and other professions as well as a patient panel and a growing awareness of the issue of non-involvement by the doctors. This case took place over six years ago when this sort of engagement of the patient in the decision making process was not as widespread within the UK National Health Service (NHS) as it is now (although it has not altogether gone away). The recent case reported in the UK press with respect to women being denied access to Herceptin (BBC 2006), a breast cancer drug, still echoes this even now – although in this instance it could be argued that it was as much to do with fiscal management as clinical efficacy. The concept of the patient being empowered to take her or his decisions as to having an intervention and what that should consist of has far more credence, today, within healthcare networks; although it is not always seen by the physician as being the most appropriate form of decision taking or necessarily achieves an appropriate outcome (Bruera *et al.* 2002). Indeed, it does have the potential to result in suboptimal clinical interventions that could lead to further complications and clinical interventions further down the line if the disease does not respond to the patient's initial choice of treatment.



**Figure 4. Patient-Centered Breast Cancer Decision Making Actor Network Relationship Diagram (IPCRS = Integrated Patient Clinician Record System)**

In this case, the patient representatives and the motivated clinical professionals set about displacing the surgeon as the focal actor, who had, up to now, taken the treatment decision within the breast cancer treatment network. The replacement as the focal actor for the network was the individual patient and her (his) informed choice. This was achieved through the input and lobbying of patient groups and a senior surgeon who was convinced that this was the appropriate way to go, accompanied by robust clinician discussions and a degree of hospital politics. The result was for the medical team to empower the patient within the treatment decision making process, changing their role from one of being fairly passive within the clinical decision making process to one of being at the centre and participative. The newly incumbent clinical lead was much more willing to have the patient make the decision for themselves with respect to treatment, though not without a strong support and a clear recommendation from their physician (Wright *et al.* 2004), particularly if they felt the patient decision was not in the latter's best interest and if the intervention was curative rather than palliative (Bruera *et al.* 2002; van Kleffens *et al.* 2004). In addition breast nurse counselors and the patients' family were also encouraged to be more active in empowering and enabling the patient to make decisions as to the treatment and procedures they would receive. The discourses of the patient<sup>1</sup> with their family and the physicians were comparable with those reported below.

<sup>1</sup> Note: the declared aim and NHS commissioned purpose of the research reported here was the scoping of the electronic patient record (EPR), its procurement and intended use. This projects' declared aim prevents the verbatim reporting of patient conversations with their physicians in this paper. However it does not prevent anonymous reporting of the context of the procurement as this was an influencing factor on the commissioning process which was explored with the sponsors of the study; the NHS Executive, of the nature of an EPR.

As the hospital was procuring a new information system at the time, the clinical team and patient representatives successfully lobbied the clinical consultant breast cancer lead to have the patient perspective included within the tendering process and also in the resulting procured IS application functionality. This entailed not only inscribing the surgeons and other clinicians' interests within the information system procurement specification but those of the patient, where the patient's interest took president. The humanchine patient-centered breast cancer diagnosis and referral for treatment network is shown in Figure 4. This change entailed the focal actor shifting within the breast surgery network from the incumbent, clinician lead, to that of the patient. Such change to the focal actor of the network would have to be overtly accepted and enacted by all the actors in the breast surgery network, human and non-human. Any EPR application procured had to accommodate the change of the structured order of this network and the new behaviors of its actors. However there was a risk in all this.

The evocation of the Emancipatory structure was intended create a new patient-centered structured order in the breast cancer diagnosis and treatment network. If this evocation had not been successful and the breast surgery network remained clinician centered, then any patient-centered information system that had been procured and installed would be at dissonance with the newly incumbent structured order and practices. Equally, if an information system was procured with only the clinician's structured order inscribed in, then it would be in conflict with the intention to provide a patient-centered service with the women patients taking the decisions. The application would, as a result, not be fit for purpose. Its procurement would be extremely expensive, as well as waste time and resources. It would also clash with the prevailing structured order, increasing the chances of its non-adoption.

The new lead clinician, in association with their sympathetic colleagues, however, persisted with procuring the new patient/clinician centered clinical information system as a component within a hospital wide procurement. They had fought strongly to displace the incumbent physician led breast cancer network, with its clinician-centric structured order, for one in which the patient was its focal actor and a patient-centric structured order. This empowered the patient while ensuring that best practice, in line with patient wishes, was delivered. Their overt aim flowing from the problematization of the current breast surgery sub-department had been to deconstruct the incumbent professional humanchine network and replace it with a 'patient centric' culture and clinical practices. The electronic clinical record system would have to be patient-centered to be an ally in this emancipatory translation. It would, of course, also have to be clinically robust and meet the physicians' professional standards in the role of diagnosing and treating breast cancer embedded within newly designed patient-centered clinical diagnostic and treatment process and protocol. A set of structured modalities had, therefore, to be inscribed into the networks' non-humans as well as being interjected by the human actors into their thinking and actions, which accommodated both the patient interests and the clinical professional interests and practices; with the formers interests as prime. Working with patient representatives to form a collective focal actor the lead clinician and breast councilors set out to do just that and create a care network with the patient as its focal actor. Drawing on this case (and related studies) an approach and set of tools and techniques for assisting in this process of the evocation of the Emancipatory structure encompassing the delineation of its information systems within the StructurANTion framework have been devised and are explored next.

## **StructurANTion Representational Tools and Techniques and Migration into IS Development.**

*"By translation we understand all the negotiations, intrigues, calculations, acts of persuasion and violence, thanks to which an actor or force takes, or causes to be conferred to itself, authority to speak or act on behalf of another actor or force." (Callon and Latour 1981)*

Wittgenstein (Wittgenstein 1958) said, "Whereof one cannot speak, thereof one must be silent." A necessity therefore to any form of representation of agency (where agency relates to informing humanchine networks) is to have languages, verbal and visual, for expressing the informing of and the creation of such humanchine networks, and in this context migration to information systems development (ISD). The use of tools, techniques, and to some extent methodologies in the designing and developing of information systems is universally acknowledged as being a major factor in both their successful development, deployment, and ubiquity (Avison and Fitzgerald 2002). Sociotechnical approaches (Berg 1999) to affecting organizational change, that, from the StructurANTion perspective, take place under the aegis of existing structured orders, are also acknowledged as contributing to

organizational change in which there are issues of culture and business process efficacy are also used a great deal. However, ‘critical’ approaches to change (Wilson and Howcroft 2002), which includes information systems and technology development that, through the evocation of the Emancipatory structure, seek to transform or replace them, are rare. A possible reason for this is that deploying such a methodology and/or tools and techniques within the context of emancipation invokes a sense of instrumentalism, which critical IS praxis (McGrath 2003) with its focus on political emancipation, through some form of socialist or revolutionary practice, seeks to both bring to light and then displace.

There are two responses to this position. Firstly, within the StructurANTion theory expounded here there are no precursor conditions for the evocation of the Emancipatory structure. What drives its evocation is that a potential focal actor, or a number of actors constituting a collective focal actor, or even another network, ‘problematizes’ from within and/or without an existing humanchine actor network, including its associated structured order (in this instance clinician domination and the shift from clinician to patient as decision maker). This is followed by ‘intéressement’, getting other actors interested in the project, awakening them to the situation and the change process necessary. Having done this, these actors – human and technological – are ‘enrolled’, i.e., they adopt the roles identified for them by the focal actor. Finally these enrolled allies are ‘mobilized’ into action to constitute a new human/machine network (Whitley and Pouloudi 2001): the humans taking on their new roles and the technologies functioning in line with the focal actor’s intent; in the example case, the patient and their desired treatment for breast cancer, supported by the clinical team and a new, to be procured, patient-centered information system, specifically an EPR.

This problematization, in turn, drives an intent and practices directed at deconstructing the existing humanchine actor network, from within or without, with the express intent of replacing it with the construction of another. The latter is achieved through the enactment of ANT’s other moments of translation, driven by a potential focal actor. The result is that either the existing humanchine network is obliterated altogether or, alternatively, it is replaced with another network along with its own newly incumbent structured order. Of course the actors in the existing network, through the evocation of its Power structured order could mobilize human and allocate non-human actors to resist this attempted translation and prevent the Emancipatory structure being fully evoked and enacted by this putative focal actor. Here the persistence of a physician centered network. But this did not happen in the example case.

When the Emancipatory Structure is invoked by an actor or actors, to challenge and replace the existing network, there are three components to this translatory modality that give rise to the new structured network. Firstly there is the ANT modality at work in the problematization of the existing network, its agency and its structured order. When this happens there is a questioning of who has the power to authorize and allocate resources, whose language significantly predominates, who is currently legitimated as the focal actor and who relates to them in other roles and subordinate positions within the existing network. Note that the focal actor can be an individual such as the patient or physician or it can be a whole humanchine network, such as Parliament or a Board of Directors, as well as a specific human/non-human or combination. Parliament is not just its politicians. From its buildings and its chambers, to its rules and procedures, its online proceedings, its’ broadcasting (as does the US Senate); they are all legislative humanchine networks. Alternatively, a focal actor may be a single human being or even a non-human such as a piece of Parliamentary legislation or even a corporate strategy or directive.

A representation of the patient-led clinical decision making network and its agency that was re-engineered to replace the physician centric network is represented in Tables 1 and 2. The actors, human and non-human, whose behaviors individually and collectively constitute the structured humanchine patient-centered breast cancer diagnostic process, are identified in Table 2. This representation of the patient-centered humanchine network entailed using Soft Information Systems and Technologies Methodology (SISTeM) tools to represent the humanchine network and its actors’ agency (Atkinson 2000). This in turn is combined with the StructurANTion theory framework to identify and represent the nature of the structures of legitimation, domination and signification that actors drew on in their agency within and constitutive of the patient-centered breast surgery decision making humanchine activity system. A further representation of the network that combines the SISTeM humanchine activity system with a UML use-case (Bennett et al. 2001) come together to constitute what is termed an ‘Integrated Development Case’, here, the Patient Centre Decision Making Network (Figure 5). Its role is to facilitate the migration into the design and development of an information system that is commensurate with the delimited human activity system. This model delineates a series of humanchine activities that were identified by the clinicians (from the original empirical study Atkinson 1997a) and the patient-centered humanchine breast cancer network they aspired to enact. The activities performed by the ‘integrated patient information system’ actor were also set out through consultations. This was

achieved through discussions by the clinicians and the patient’s representatives in a series of group working exercises that were staged by the IS Project manager to underpin the procurement process of the new hospital wide IS. Hospital members also visited Brigham and Women’s Hospital, Boston, USA, who are highly innovative and participatory in their in-house development of an integrated patient record system (<http://www.brighamandwomens.org/>). These were subsequently used by the hospitals’ IS team, clinician managers, and patient representatives through a process of end user led procurement of the new patient-centered, hospital wide clinical information system for breast cancer. The outcome was a patient-centered Clinical and Administrative System being procured and implemented, that was in line with their patient-centered approach to care and information management, that was eventually to be rolled out across the whole hospital structured humachine network.

**Table 1. Types of Actors and their Manifestations in the Breast Cancer Treatment Decision Making**

Manifested as → Actor type ↓	Corporeal Actor	Representation of an actor within another actor:	Enactment of a virtual actor by another actor to give it existence:
Human Actors	Patient (Focal Actor) Surgeon Breast Counselor Nursing staff	IPCRS Human Actor UML Objects in IPCRS Patient Surgeon Breast Counselor	
Artifact (Machine) Actor	Patient/Physicians Support Information System	Artifact Actor UML Objects in IPCRS Treatment Decision Clinical protocol Tests & their results Discharge letter	Clinical protocol Legal rights  Hospital guidelines enacted by Patient and Surgeon
Humachine Actor		Humachine UML Actor Objects in IPCRS Diagnosis (Breast Cancer tests and investigations)	

## Conclusion

“The duality of technology identifies prior views of technology – as either objective force or as socially constructed product – as a false dichotomy” (Orlikowski 2000 p.406).

These explorations have used as their point of departure the StructurANTion framework and how it has been deployed to represent and research into the structured nature of informed humachine activity systems. First, it has identified how such structured networks of people and technologies both persist and change incrementally over time and space. Second, it has looked at how such networks transform themselves dramatically, or is succeeded altogether, through the overt intent of its actors and/or in response to internal and external forces or both. The particular focus has been on the manner in which the Emancipatory structure, latent in all networks, is mobilized to facilitate that transformation by a focal actor from an incumbent to a ‘new’ structured order (without judging whether the outcome is better or worse). It moves away from delineating the Heideggerian ‘being’ (Heidegger et al. 1962) of a humachine network achieved through the structure -> modality -> action cycle of the StructurANTion framework to that of its radical ‘becoming’. The latter is facilitated through the evocation of the frameworks’

Emancipatory structure. Such an evocation is an overt exercise of the 'will' by that focal actor necessary to realizing the potentiality of a prospective humachine network. In the example shown here it has been essentially female emancipation that is the focus. In particular the concept of the female patient becoming the focal actor of a structured clinical humachine network. Within that emergent network, the female patient takes control over the power over human and machine non-human resources necessary, is designated the legitimated role of the decision maker and is spoken to in an understandable language showing appreciation of her situation and allows her to express her desires as to what is done to her body and by whom. Aligned with her in this newly emergent structured order, from the emancipatory StructurANTion perspective, are information systems and technologies. These recognize the patient's legitimacy to information through designated passwords, provides her with access to clinical and informational resources that are dedicated to her, through appropriate lay oral and visual languages. The StructurANTion framework, as is argued and explored here, allows for the representation of the prospective humachine network and in so doing has the potential to not only describe that prospective network but, it is argued here, underpin the emancipatory praxis of a focal actor, necessary to realize it. In so doing, StructurANTion aims to overcome the narrowness of current and conventional approaches to people and technology, and facilitate the emergence of a new form of ISD, one in which a wider appreciation of the facilities which need to be mobilized to meet the needs of all the actors involved is seen.

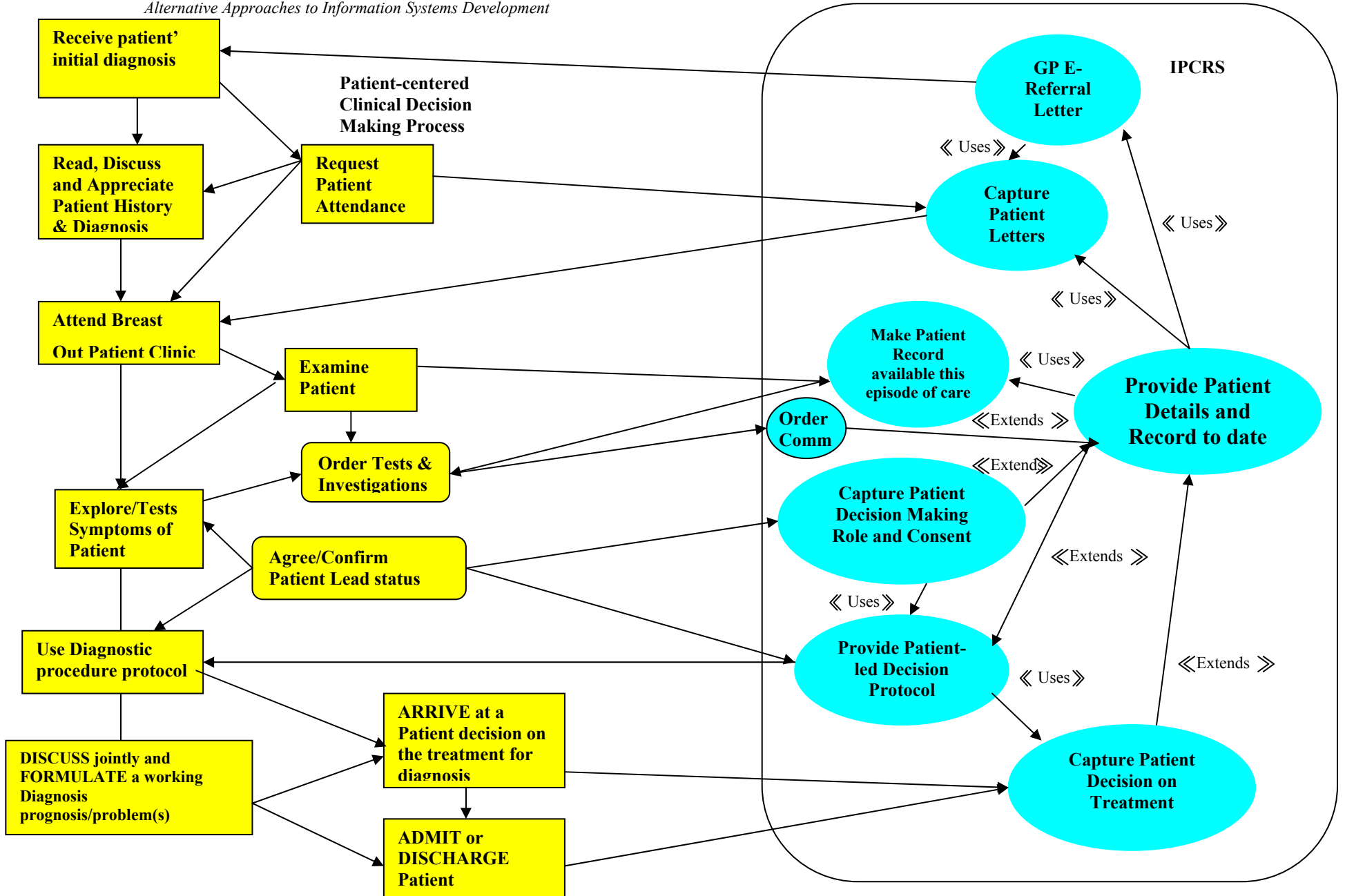


Figure 5. Integrated Development Case of the Humachine Patient-centered Decision Making Network

**Table 2. Breast Cancer Diagnostic Networks Humans and Non-Human Actor Structural Modalities**

<b>Structure</b>	<b>Signification</b>	<b>Legitimation</b>	<b>Domination</b>
Modality Actor	Interpretive Scheme <i>Knowledge Language</i>	Norm <i>Rights Obligations</i>	Facility <i>Authorization Allocation</i>
Patient (Focal Actor) <i>Human</i>	Expressions of their insight into their own body and condition, their fears concerns and needs using their own language and insights as well as information from IPCRS 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 and update patient's own notes. Obligated to decide or abrogate to 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. Right to access their notes
Oncologist <i>Human</i>	Clinical Knowledge linked with diagnostic expertise skills expressed in clinician's and patient's language	Support the patient with a diagnosis decision making Access/add clinical and patient information with the patient in their notes in PCIS	Authorize surgeon and allocate theater plus post operative resources in line with diagnosis and treatment decision
Surgeon (Previous Focal Actor) <i>Human</i>	Clinical knowledge linked with diagnostic and surgical expertise & skills expressed in clinician's and patient's language	Obligated to support the patient in her clinical decision making and up date patient notes. Right to disagree and withdraw from caring for patient, offering alternatives	Capacity to order clinical human, material and informational resources are available to the patient and the procedures undertaken to treatment decision
Breast Counselor <i>Human</i>	Clinical knowledge and Lay language with which to speak of breast cancer with patient. Knowledge of patient psychology in response to CA	Obligated to support the women in her making a decision in line with her wishes. Right to speak on behalf of the patient	Authorized to empower the patient through the allocation of patient-centered skills and resources to enable her/him make abrogate their decision
Patient Clinical Information System (PCIS) <i>Non-Human</i>	Provides clinical information to patient (and clinician) about themselves, their condition and treatment in the appropriate lay and professional languages	Has the right or authority and is obliged to provide information to patient and clinician in format and content appropriate to both.	Allocate clinical information to the patient and clinicians. Authorized to facilitate communications between patient and clinicians via PCIS& Notes
Referral	Patient/GP referral in patient language & clinical terms	Initiate process of care be appropriate referral	Authorize & allocate clinicians plus health care resources
Diagnosis CA Breast <i>Non-Human</i>	Expressed in a way that is understandable to the patient and in current clinical terminology.	The diagnosis medical cogent and is also commensurate with patient's expressed requirements	Allocates appropriate clinical resources. Authorizes clinical personnel to make diagnosis
Legal Rights of Patient <i>Non-Human</i>	Sets out in lay and technical language rights of the patient with respect to diagnosis and treatment decision & treatment	Identifies what the patient and clinician can and cannot expect of their legal rights within clinical practice.	Set out the resources personnel and artifacts the patient clinician may draw on to protect their lawful rights.
Patient-centered Protocols <i>Non-Human</i>	Support of patient clinical decision making on treatment commensurate with effective practice treatment	Enshrines with in it the rights and obligations of patient and clinician necessary to undertake a diagnosis and treatment	Allocates resources and authorize the clinical personnel necessary to realizing the patient's decision on breast cancer treatment
Hospital Guidelines <i>Non-Human</i>	Provides in lay and technical language those clinician practices that a patient can expect from a clinician	Set out the rights and obligations of both patient and clinician to legitimized treatment and services.	Provides a framework with which to guide the patient in the allocation of resources authorization of personnel
Patient's Treatment Decision	Signifies, in lay and clinical languages what is needed to be undertaken to address patient's diagnosis	Give the patient the right to make a decision on treatment to meet her diagnosis	Allocates to patient the resources and information necessary treatment decision authorizes clinical expertise.



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