A Telemedicine Case Study for the early phases of Value based Engineering

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A Telemedicine Case Study for the early phases of Value based Engineering

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This following case study has been conducted by the Institute for IS & Society at the Vienna University of Economics and Business (WU). It is a case study of a telemedicine start-up that has been planning an Austrian service roll-out between 2017 and 2018. The startup called "TM" in this document has been co-operating with WU's Institute for IS & Society from mid 2018 to early 2019. This telemedicine case study shows how Value-based system design in its early "ethical design thinking phase" is working; what results it produces.

The operational concept details, the corporate service context, values identified and recommendations made here are directly derived from this real-world telemedicine field-example. However, the stakeholders involved in this case study have not been the "real" stakeholders TM needs to work with for true value-based design. Instead WU Vienna worked with students of a Master Class in Innovation Management who have been imagining the various stakeholder perspectives. So, effectively, participants in the Master Class simulated real-world stakeholders while working on the real-world case. The real-world case was supported by the CEO of TM who presented his business ideas to the students of the Master Class in the fall of 2018. He also shared his business plan and background descriptions of TM with the authors of this document.

The TM case described in this document illustrates how the IEEE P7000 Ethical System Engineering Standard (in the making) would work according to its 2nd D2 Draft released to the IEEE P7000 Working Group in August 2019.

On the authors: Prof. Dr. Sarah Spiekermann has been co-chairing the IEEE P7000 Standard from 2016 onwards and her Ph.D. Student Till Winker has equally been a member of the IEEE P7000 working group. Ph.D. student Kathrin Bednar has supported the conceptual value analysis as well as value elicitation presented in this case study.

Abbreviations

SOS – System of System

SOI – System of Interest

EVQR – Ethical System Level Value Quality Requirement

Glossary

ethical: supporting positive value unfolding and prohibiting negative value unfolding

ethical system level value quality requirement (EVQR): an organizational or technical system requirement corresponding to a value quality that stakeholders identify as relevant for the SoI

operational concept: verbal, written and graphic statement, in broad outline, of an assumption or intent in regard to an operation or series of operations of SoI containing major system elements and/or system components, information on boundaries showing the SoI and its immediately relevant SoS landscape, data flows and responsibilities

NOTE 1: The operational concept should include all major product, service or system elements and/or system components, boundaries and directly adjunct elements beyond boundaries, internal and external input elements (i.e. databases and/or applications serving the system that may be outside of the SoI's boundaries) and output elements (i.e. databases and/or applications serving the system that may be outside of the SoI's boundaries).

stakeholder: individual or organization having a right, share, claim, influence or interest in a system or in its possession of characteristics that meet their needs and expectations

system-of-interest (SoI): system whose life cycle is under consideration in the context of this standard

system of systems (SoS): system-of-interest whose constituents are themselves systems.

value: conception of the desirable, which influences the selection from available modes, means and ends of action. It is an independent phenomenon that can be perceived and/or aspired and is constituted of value qualities. It is carried by a value bearer, including things, persons, relationships or activities.

NOTE 1: Perception of a value is possible for living beings due to observable and/or sensible value qualities that are carried by value bearers. But a value does not need to be physically perceived or sensed to exist. Its existence is already constituted by its desirable nature that can be felt by humans more or less in the form of aspiration.

NOTE 2: A value can be positive or negative. A positive value is intuitively recognized because of its relatively high desirability. A negative value is marked by its undesirability; recognized through the emotive intuition of repellency.

value cluster – a visualized cluster of values containing one core value and several value qualities instrumental to and/or related to the core value

core value – a value that is identified as central for a system of interest. A core value is at the center of a value cluster of instrumental and/or related value qualities.

value quality: is a value itself which is instrumental to a core value in the context of a SOI. A value quality is always instrumental for a core value. It can be positive when stakeholders associate benefits or positive potentials with it. Or, it can be negative if stakeholders associate harms and threats with it.

Exploring and Setting the Ethical Context

1.1. Context-of-Use Description

(in line with section 8.5.1 in IEEE P7000)

1.1.1. Overview

A telemedicine start-up (hereafter short "TM") is planning to offer remote patients video-conferencing with TM doctors to get immediate diagnosis, sick-notices and referrals to specialists. The company's unique selling proposition is supposed to be a database of particularly trustworthy and recommended specialists. TM doctors refer patients to these specialists and thereby give them efficient access to high-quality treatment. TM's database is built up through regular questionnaire-based querying of ordinary doctors from around the country who are personally asked to recommend only those colleagues they would have treatment with themselves. The specialists thereby collected are regularly reviewed by a TM advisory board. The initial operational concept is depicted in figure 1. It foresees that patients dialing into the platform first fill out an online diagnosis-form, which then facilitates a short and efficient online video-conversation with the TM-doctor. In the long term, data collected through the diagnosis form is planned to be analyzed with Machine Learning to train an AI-based diagnosis tool.

1.1.2. Data Flows (data senders, recipients, data types, transmission type)

Data flows (which must be recorded in more detail in the form of a procedural log in line with European General Data Protection Legislation) specify *what data* is collected, *the type* of data collected, the *data subjects* and *data recipients* and the *form of transmission* chosen.

In this case:

1. Sensitive personal health data flowing from patient(s) to TM's pre-diagnosis system and over video chat to the TM doctors

2. Sensitive personal data flowing in the form of (a) life video-chat data, (b) video-chat recordings or (c) further personal data exchanges (i.e. e-mail?) from patient(s) to (a) TM doctors, to (b) local TM system (i.e. storing video chat recordings locally), to (c) (potentially) video chat

provider when storing video-chat recordings remotely, to (d) (potentially) database/cloud provider (processor)

3. Personal scheduling data of patients

4. Personal data flowing from TM doctors back to (a) patients, (b) to specialists and to (c) TM record-keeping database(s) in the form of (a) referrals, (b) prescriptions, (c) sick-notices and (d) diagnosis

5. TM is the data controller, potentially working with one or more data processors, including (1) a database or cloud provider, (2) a video chat service provider, (3) a medical diagnosis-system provider.

   The personal data type in this case is sensitive personal data.

1.1.3 **Processes (core processes, support processes)**

Core processes:

- Patient online pre-diagnosis, patient chat with TM doctor (including the scheduling and the outcomes such as the receipt of referrals, sick-notices, prescriptions)

- Building and maintenance of specialist database (including the reaching out to doctors for recommendations, data quality management, advisory board revision cycles)

Support processes:

- Scheduling of Patients

- Recruitment and management of TM doctors, of TM advisory board, TM infrastructure management, TM service provider management (including service level agreements with eco-system such as cloud provider, chat provider, IT support, versioning of TM platform, etc.)

Note: For analyzing the ethical context several assumptions are being made to anticipate possible ethical outcomes **if** the company was growing healthily over time:

Market share is assumed to be significant for TM; patient referrals coming from TM are assumed to generate 30-40% of the business for recommended specialists.

The place of service usage for ethical analysis is assumed for patients to be their private homes and for TM doctors to be the building facilities of TM.

The geographic market place is only within the German speaking countries Austria, Germany and Switzerland. Yet more than 10% of

patients dialing into the TM platform do not speak German well enough to conduct a conversation in German (minority).

The interface is assumed to be a stationary computer terminal for both patients and TM doctors. It is not foreseen to optimize TM for mobile devices because health conversations should take place in a stationary setting and not at any mobile location such as bus-stops, restrooms or public parks

1.2 Concept of Operation

The initial scope as depicted in figure 1 broadly describes the TM system in terms of (1) stakeholders, (2) data flows, (3) processes and (4) technical system elements involved.

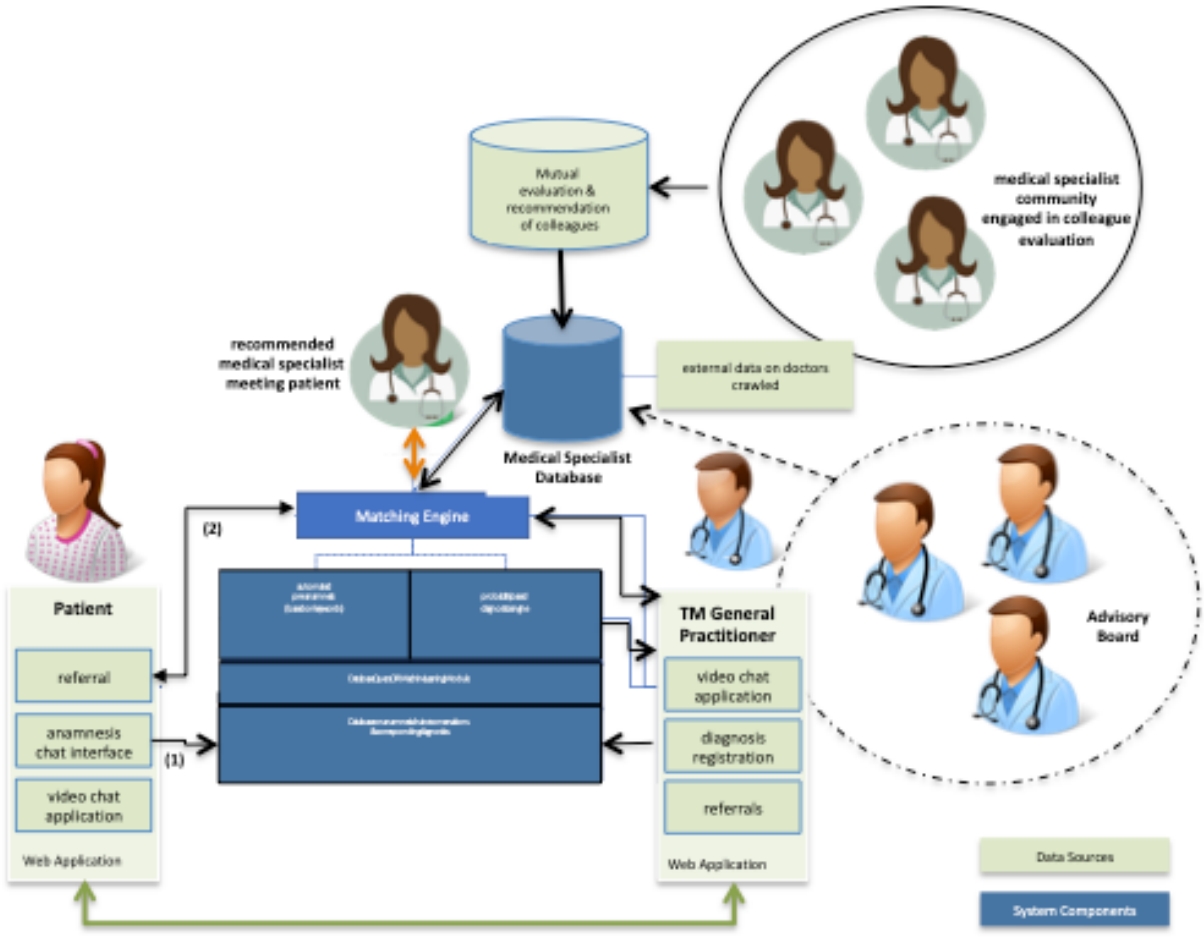


Figure 1: Initial Operational Concept of TM

1.3 **List of Stakeholders (direct and indirect)**

(in line with section 8.5.2 in IEEE P7000)

Direct stakeholders: patients, TM doctors, TM as an organization

Indirect stakeholders: specialist doctors recommended, specialist doctors not recommended, recommending doctors, TM advisory board, insurance companies, society at large

Note: In line with section 8.5.3 and in order to understand TM's ethical situation, various consultation rounds should mix the following representative stakeholders: TM's CEO, TM's COO, technical expert responsible for building the platform, TM in-house doctor, potential patients of various age classes, healthy as well as chronically sick patients, medical association representative(s), doctors who believe in the human touch rather than in video-chat as well as doctors who are very tech-affine, doctors from the city and from the country-side, general doctors as well as specialists, insurance companies.

1.4 **Organizational control over the TM platform**

(in line with section 8.5.3 in IEEE P7000; System of System View, SOS)

TM's system is integrated in a SoS with other technology providers, notably:

TM plans to work with a 3rd party private-cloud provider (processor) who hosts both the TM patient platform as well as the medical specialist database (so all technical system components marked in blue in figure 1). This is *an acknowledged SoS relationship* in the sense that resources are foreseen in TM's business case to regularly audit and revise the terms and conditions of collaboration.

TM needs to integrate a highly reliable, high-quality, highly secure video-chat provider and has not found the right partner yet. So far there is no possibility to provide for an *acknowledged* SoS relationship because available video-chat web-service providers only offer commercial-off-the-shelf contract conditions. TM is screening the market for proprietary video-chat functionality that could be purchased and integrated as a fully proprietary solution into TM's platform; effectively turning the *currently virtual SoS* relationship into a directed one.

	TM Proprietary Platform hosted at private cloud provider	TM video-chat partner	Control Estimate
Patient stable data (master data, medical history, pre-diagnosis data)	acknowledged		high
Patient dynamic data (video-chats)		virtual	low
Specialists Data	directed		high
Doctoral Network	directed		high

Table 1: Exemplary control sheet to characterize and judge control over SoS (*the content of this sheet shows the type of SOS relationship and the degree of control over the external system*)

1.5 List of preliminary values and concerns before engaging in value-based engineering

(in line with section 8.5.6 in IEEE P7000)

Based on its operational concept (figure 1) and general awareness of press articles and legal surrounding, TM initially identified 12 values for its business case material. The company stressed **efficiency, convenience and flexibility** for patients and doctors due to less physical encounters. At the core of its value proposition, the company is foreseeing a **health** improvement for patients, because of **access** to exclusively pre-selected **high-quality** doctor **expertise** that is identified through recommendations and hence a certain degree of **objectivity** in doctor selection. Insurances might **save cost** due to patients seeing less doctors in their attempt to find the right and good one. TM also recognized that due to the exchange of health data it would be responsible to ensure the **security and privacy** of patient data through encryption. The company foresees to make money and generate **profit** from (1) the fees that patients pay for the service (ideally recoverable from health insurance), (2) partner companies that offer the TM service as a benefit to their customers (i.e. telecom providers) and (3) potentially – in the long run – patient diagnosis data and Machine Learning insights gained from the chat and diagnosis data.

2 Understanding the Ethical Import of the SOI

(artefacts of the Value Elicitation Process, section 9)

2.1 Context Exploration Description

(in line with section 9.5.1 in IEEE P7000)

Since the TM start-up does not have any operations yet except a prototypical website, student participants in this case looked at the website and listened to a presentation of the business case of the TM company. Based on the context description outlined above student participants then analyzed TM with a view to the potential interests of direct and indirect stakeholders. 18 student pairs envisioned worked under the supervision of two value experts.

They were asked to (1) systematically describe the potential harms and benefits caused by the system described in figure 1 as well as (2) personal long-term character effects on direct stakeholders (virtues) and (3) personal maxims; that is highly important values impacted by TM that they would want to foster and protect. For all harms, benefits, virtues and maxims they were asked to (4) name the respective underlying values/virtues. They should also (6) think of improvements to the initial operational concept of the TM system as outlined in figure 1. The online questionnaire that was used by the participants can be consulted online at: https://surveys.wu.ac.at/sustainit/index.php/333966?lang=en

Note: Values are sometimes named directly by stakeholders participating in this value elicitation process (in this case students). Sometimes, however, they are not named directly. They are just circumscribed when thinking about potential harms and benefits, character implications, system improvement ideas, etc. The collected material must therefore be sorted and analyzed by a value expert. The value expert must infer what values were precisely meant. This inference process can either be done by anticipating what was really meant by the stakeholder descriptions or by looking at the product/service improvement suggestions they have made to the operational concept. Inference is a highly qualitative exercise the value expert needs to excel at. For example: when stakeholders call for "encryption of data" it can be inferred that they want to increase the value of "security". In TM's case two independent coders extracted from the collected material the values relevant for the TM use case.

2.2 Total Value List

(in line with section 9.5.2 in IEEE P7000)

The following figure illustrates the complexity of the value space that is relevant for TM and that has become apparent through the value elicitation process. At the center is of course the value of health. This obvious value is at the core of the telemedicine platform. After cleaning the data and discerning simple ideas from values, giving values consistent names, deleting redundancies, etc., 93 unique values were found relevant for the TM case that will somehow impact this health service.

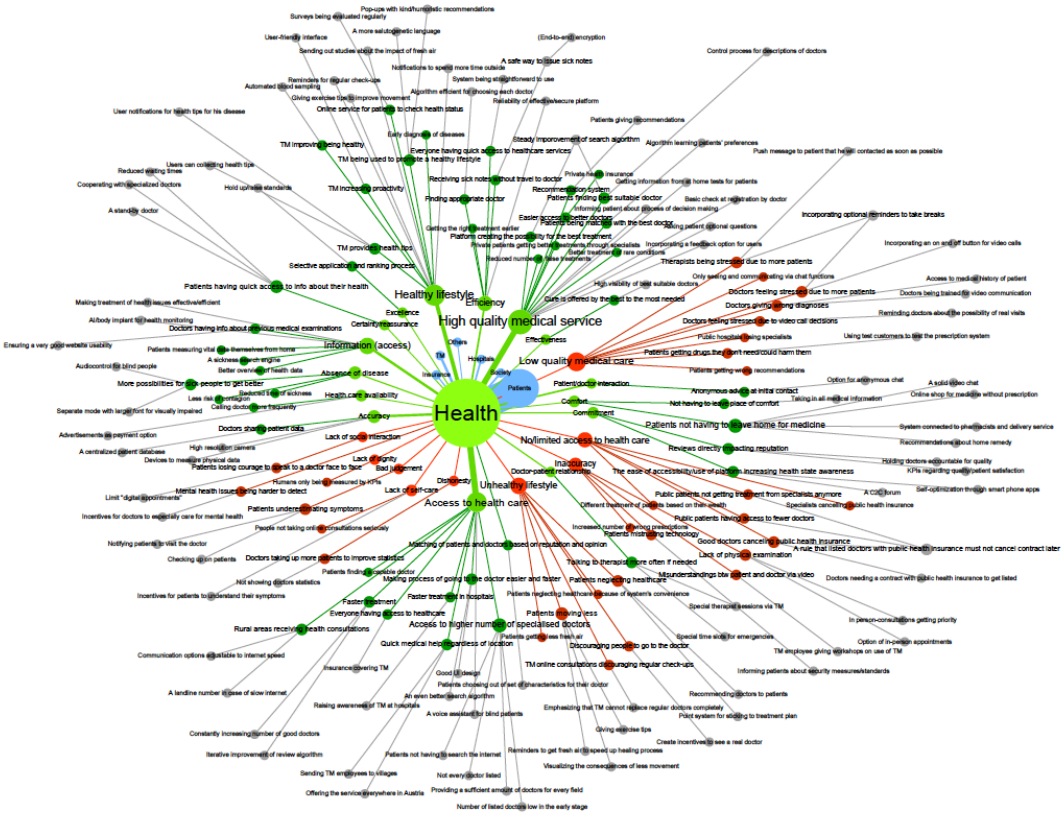


Figure 2: Value space including all stakeholder values; that is the core values, the value qualities as identified by the value experts, the descriptions of harms, benefits, virtues maxims and ideas for to the operational concept

The 93 values mentioned by "stakeholders" (effectively participating students) include:

Health, Trust, Equality, Efficiency, Privacy, Honesty, Accuracy, Knowledge, Comfort, Reliability, Helping people, Fairness, Patience, Empathy, Wealth, Compassion, Excellence, Transparency, Safety, Dignity, Accessibility, Freedom, Innovation, Truth, High quality medical service, IT Security, Responsibility, Carefulness, Commitment, Autonomy, Belongingness, Cooperation, Happiness, Caring, Diligence, Contentment, Flexibility, Individuality, Respect, Confidence, Legality, Recognition, Rightfulness, Aesthetics, Availability, Loyalty, Professionalism,

Trustworthiness, Competitiveness, Convenience, Self-improvement, Social interaction, Time, Work, Accountability, Credibility, Greed, Envy, Gratitude, Self-caring, Temperance, Hope, Joy, Justice, Integrity, Punctuality, Solitude, Competency, Persistence, Reputation, Self-interest, Success, Dedication, Faith, Fulfillment, Inertia, Motivation, Openness, Rejection, Relevance, Stability, Community, Incorruptibility, Live a better life, Modesty, Pride, Proper ambition, Self-awareness, Self-care, Self-doubt, Self-esteem, Tenacity, Wisdom

2.3 Value Clusters

(in line with section 9.5.4 in IEEE P7000)

From the 93 values mentioned, value clusters are built by the value experts. The collected value space includes 14 value clusters, which contain each one core value that repeatedly comes up in TM's ethical value analysis. Figures 3 to 16 visualize these value clusters

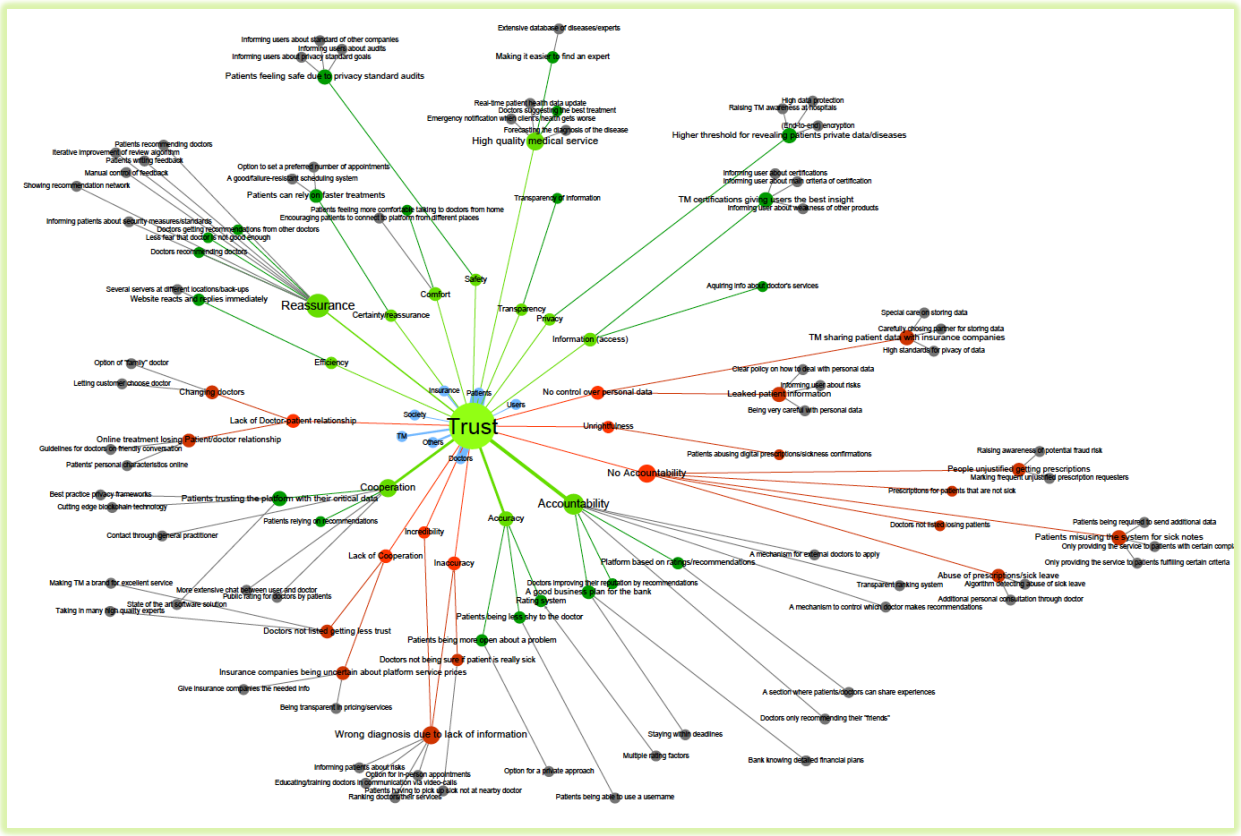
Note: The number of core values identified in an IEEE P7000 elicitation phase is the result of a qualitative judgment that value experts should make and confirm with stakeholders. There is no specific cut-off value or measure that would dictate how many core values and respective value clusters are needed. ***It should not only be the number of core-value mentionings*** *that is considered here for mapping. Also the business case, the company perspective, the insights from early feasibility studies, discussions and discrepancies among stakeholders etc. can influence how many and which core values enter further analysis.*

Value clusters and the ethical ideas contained in them are value potentials, not absolute values that must necessarily materialize. The system's technical and organizational value dispositions later created by TM's operations will determine how the whole system will effectively come out and which one of these value potentials materialize. The value of health is often mentioned, but its value qualities largely embrace the core values analyzed in all of the other value clusters. Since the core values described in the value clusters are all catering to TM's goal of health, health is not separately analyzed here.

The core value figures below show a **core valu**e in the center that is always in light green to signal that this core value should be positively fostered and worked towards by TM. These prominent positive core value potentials can be undermined if there are too many negative value qualities potentially undermining it; here such negatives are visualized in terms of light red incoming negative value qualities. In contrast, light green positive value qualities signal that TM is considered to have positive potential to strengthen the respective core value. Value qualities are again resulting from deep red value harms and deep green value benefits as well as *value dispositions* in the SOI.

Value dispositions (captured here in form of early improvement ideas for the SOI) are represented in grey in the (total) maps below. They are technical or of organizational ideas for the operational concept noted in down during value elicitation. *In fact the ideas for the operational concept - value dispositions - are often helpful for value experts to understand what value qualities are really meant.*

2.3.1 The Role of Trust in TM's Business (Value Cluster Description)



3a: Trust (complete value cluster with ideas for operational concept)

Right after health itself, trust is the most important value for the participants of TM's value elicitation process. It therefore cannot be ignored by TM. It is a challenge for the business, because negative value qualities have been identified that can undermine stakeholder trust in TM. The most important trust breaker is a lack of accountability that could result from the platform, because patients might abuse the platform for getting quick prescriptions and unnecessary sickness notes. Also the doctor/patient relationship could suffer due to the virtuality of the encounter. At least the relationship with TM doctors could be less good than the kind of relationship we have today with today's family doctors. This is, because TM doctors might change frequently. It might be that TM doctors make a wrong diagnosis as well, because they do not meet patients physically and do not build up a relationship over time. Trust can also suffer if TM breaches privacy by sharing patient data with 3rd parties, such as insurance companies or sees a leakage of patient data.

At the same time, TM has positive trust potential. Because TM offers only recommended specialists, patients gain reassurance that by dialing into TM they only see "good" specialists. So if TM meets this expectation and only recommends high quality people then this is a major trust driver. Transparency of how specialists are identified is

important here to make customers feel good about the service's operations, its accuracy and accountability. Transparency is also important for customers privacy perceptions. Customers want to know what is happening to their personal health data. Finally, there is trust potential in the digital service itself. Not only does it allow patients to find good doctors faster (speed); the TM service could also offer a digital health service to its customers, such as some pro-active notifications or monitoring services. For such a service and generally TM's platform must work seamlessly. Reaction times must be fast and reliable.

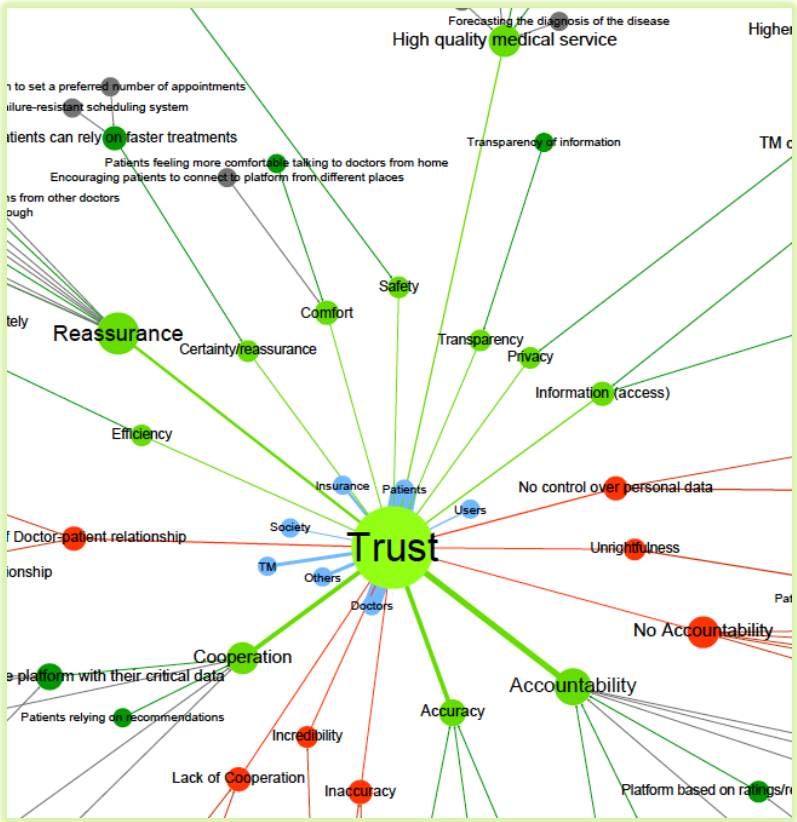


Figure 3b: Trust (Core Value & Value Qualities)

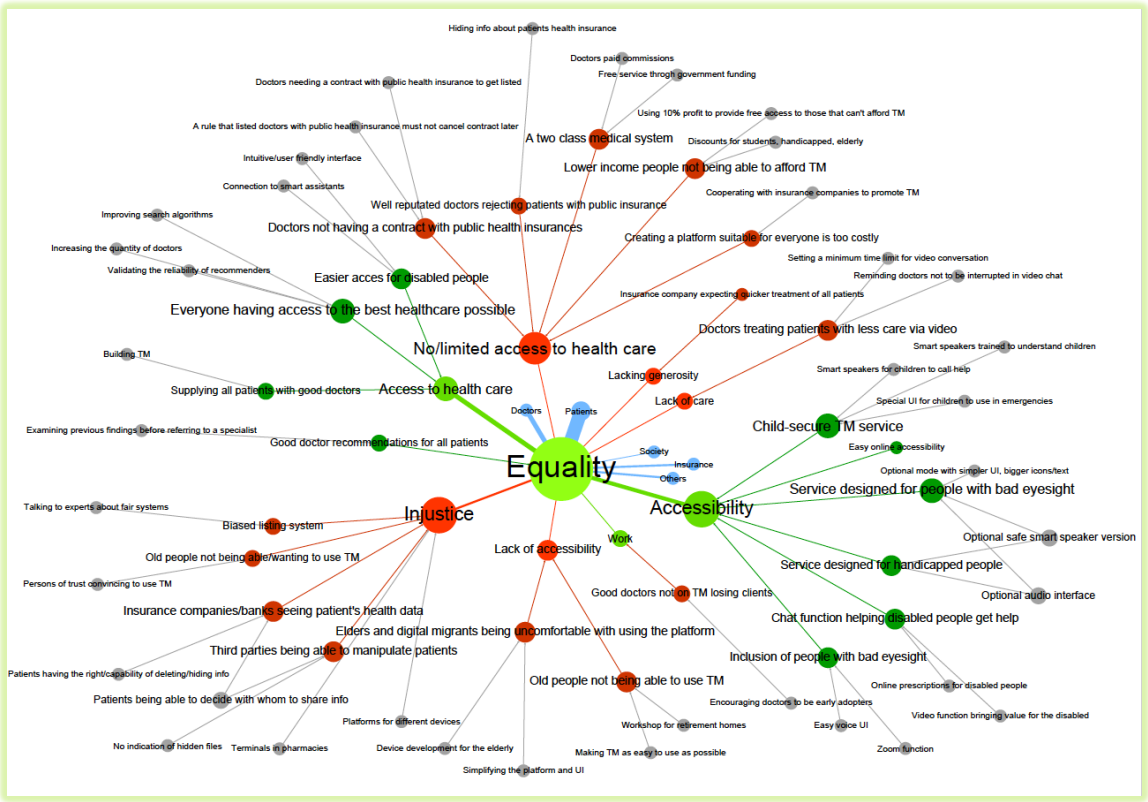
Core value: trust

Positive value quality potentials instrumental to trust: reassurance of specialist quality (specialist), openness of patients leading to accuracy (TM), accountability of criteria for judging specialist quality (TM), privacy of patient data (TM), reliability of service availability (TM)

Negative value quality potentials instrumental to undermine trust: lack of accountability/sincerity among patients, lack of accountability among TM doctors (TM), specialist exclusion (specialists), loss of doctors cooperation/competition (specialists), privacy breach (TM), lack of diagnosis quality due to TM doctors' virtuality, lack of diagnosis quality due to instable doctor-patient encounters (TM)

Ethical System Level Value Quality Requirement (EVQR): + specialist quality, + TM accuracy, + TM accountability, + TM availability, - patient sincerity, - TM doctors accountability, - specialist exclusion, - doctor cooperation, - patient-doctor stability/virtuality, - patient-doctor care/virtuality, + - privacy

2.3.2 The Role of Equality for TM's Business (Value Cluster Description)



4a: Equality (complete value cluster with ideas for operational concept)

Equality was mentioned frequently by participants of the value elicitation process. The positive potential seen for TM is twofold: First, handicapped and elderly people or those with bad eye sight can use TM to see a doctor where otherwise they would have difficulty to do so. And secondly, it is recognized that TM can give anyone information on a good specialist where such a referral is otherwise difficult to get, because one needs already some connections into the health care community to learn what specialist doctor is really recommendable.

That said, the equality potential can also turn against TM, because especially elderly people might not want to use TM due to a lack of computer efficacy. It might also be that TM's service is too expensive to afford for low-income people, either because TM's service is too expensive or because the specialists being recommended (or flocking to the system) are frustratingly expensive for patients. Who benefits from a specialist that one cannot afford?

The value cluster for equality seems to suggest a dilemma for TM: On one side it is wanting to promote equality; that is access to highly recognized specialists. But the cost for the high quality, both for the recommendation itself and for further treatment might cause inequalities or make these more visible.

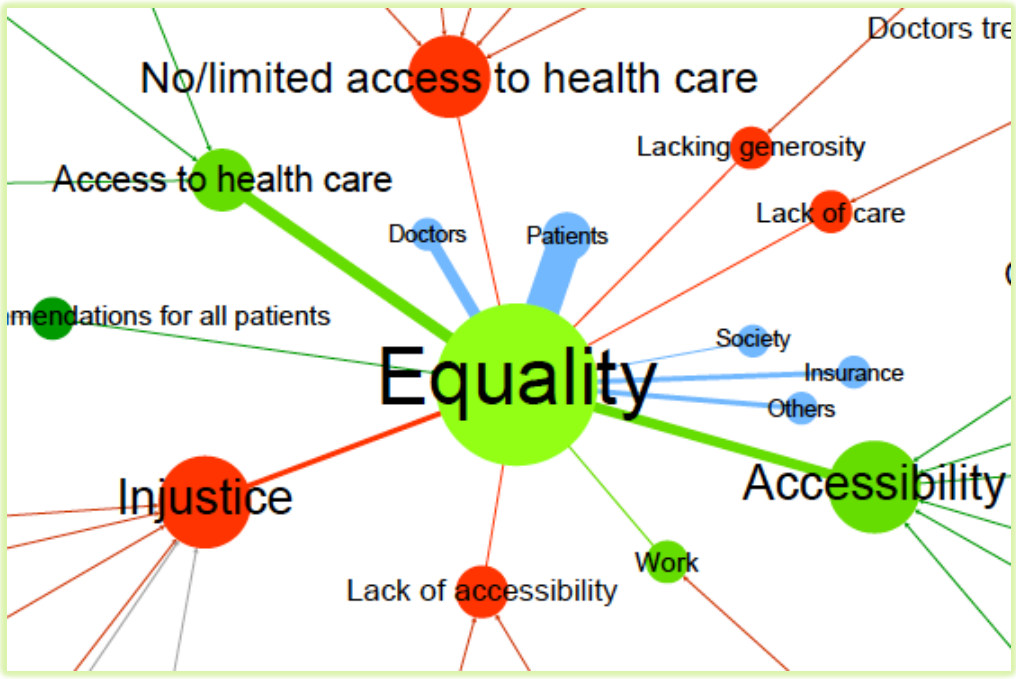


Figure 4b: Equality (Core Value & Value Qualities)

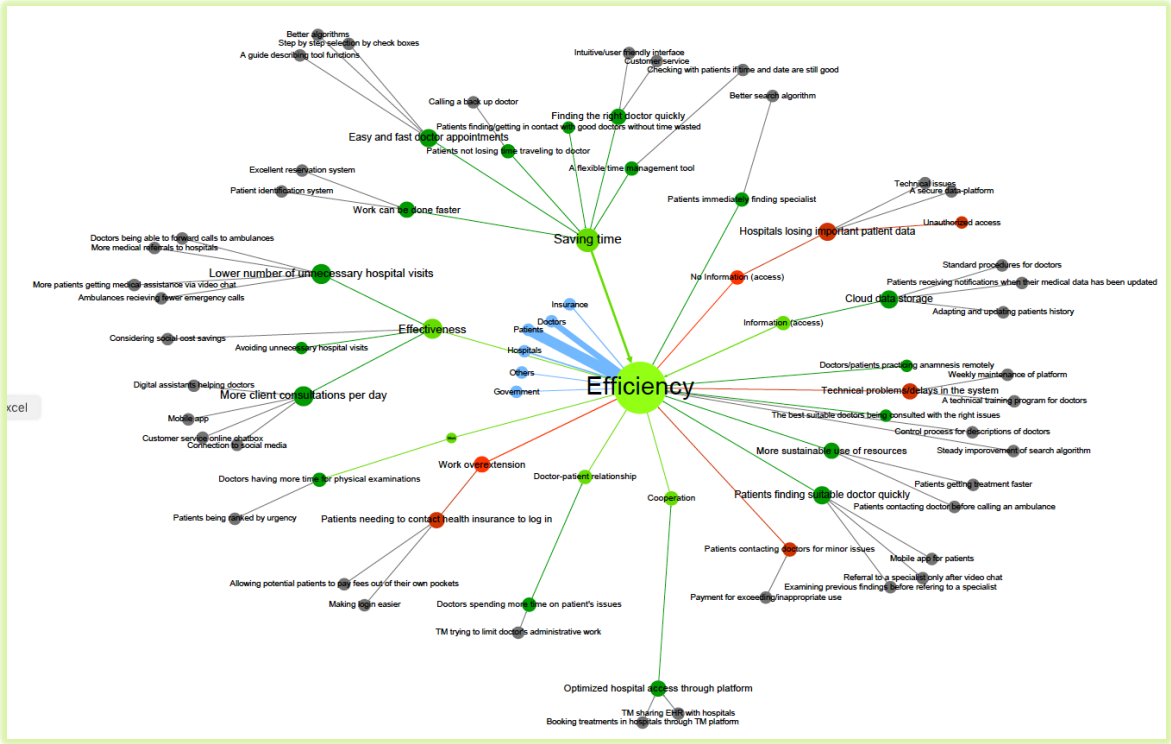
Core value: Equality

Positive value quality potentials instrumental to foster equality: inclusion of those who cannot physically attend a doctor (patients), access in terms of learning about the right specialist (patients)

Negative value quality potentials instrumental to undermine equality: lack of inclusion due to lack of computer efficacy (patients), lack of inclusion depending on insurance status (patients), loss of care for virtual patients (TM doctors), profit motives driving virtual encounters (insurances)

Ethical System Level Value Quality Requirement (EVQR): + - patient inclusion, + specialist accessibility, - patient-doctor care/virtuality

2.3.3 The Role of Efficiency for TM's Business



5a: Efficiency (complete value cluster with ideas for operational concept)

As for many digitalization projects efficiency is a core value expected to result from TM practice. Easy and fast doctor appointments and less time with the initial diagnosing TM doctor, fast specialist identification, not traveling to the initially diagnosing doctors, all make this service efficient. All stakeholders save time.

Technical problems or patients losing their passwords to enter the service might decrease efficiency. Another negative value quality undermining efficiency might be overuse of the service, because it is so easy to access doctors.

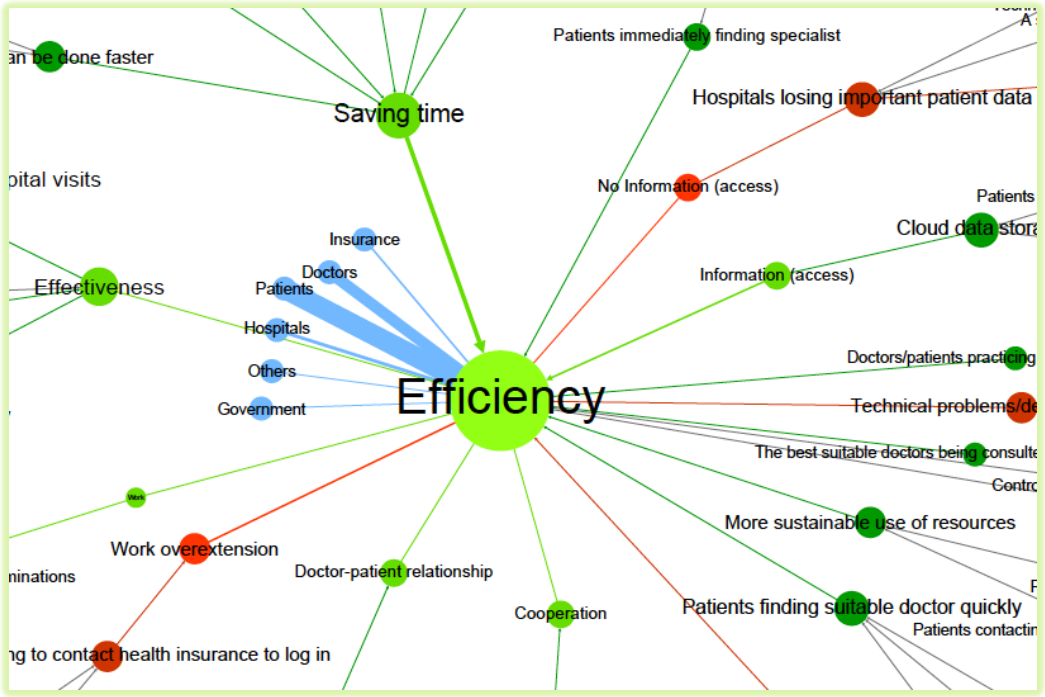


Figure 5b: Efficiency (Core Value & Value Qualities)

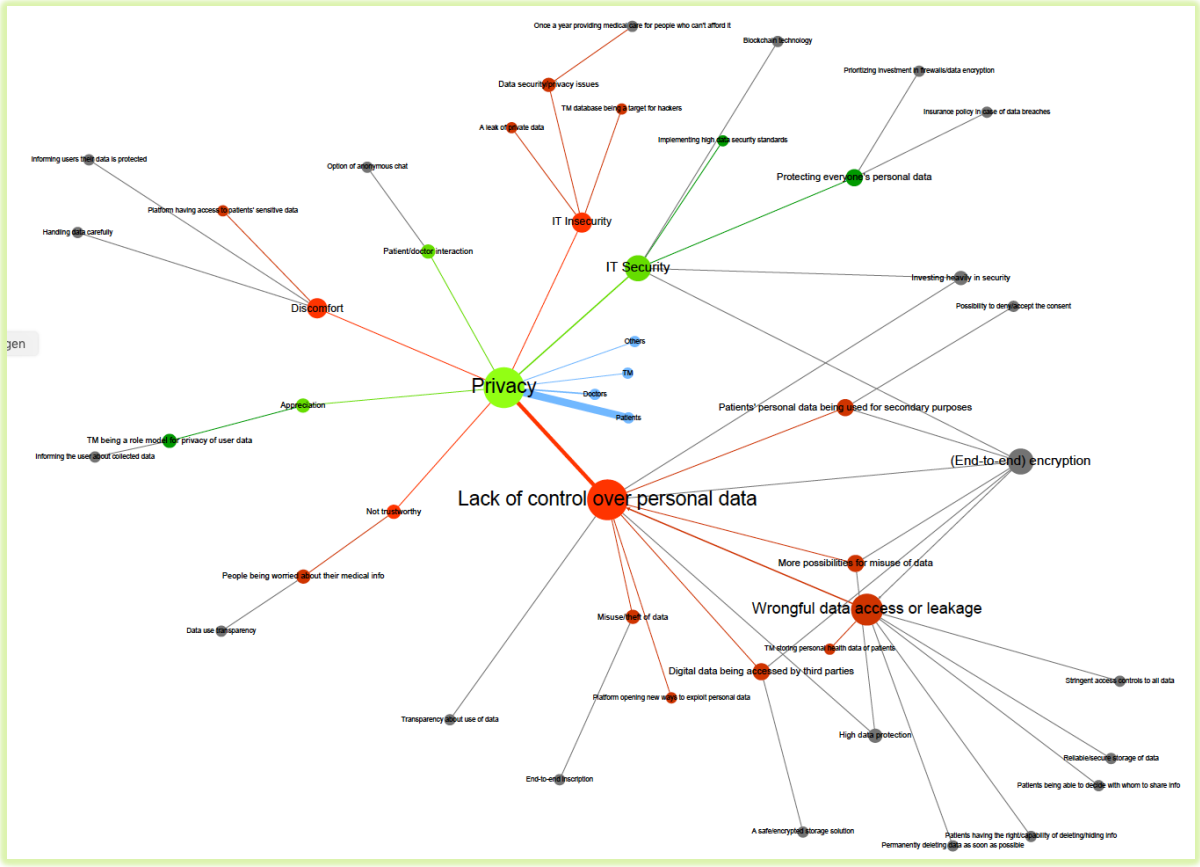
Core value: Efficiency

Positive value quality potentials instrumental to foster efficiency: accessibility of specialists (patients), effectiveness through time savings (patients), effectiveness through time savings (TM doctors), effectiveness of health system

Negative value quality potentials instrumental to undermine efficiency: accessibility of specialists undermined because they are overwhelmed by additional patients from TM, overload of TM doctors, because patients dial in too often for minor purposes

Ethical System Level Value Quality Requirement (EVQR): + - specialist accessibility, + consultation effectiveness, - TM doctor overload

2.3.4 The Role of Privacy for TM's Business



6a: Privacy (complete value cluster)

Privacy is considered as being challenged by TM. Many participants are fearing that patients could lose control over their health data, that TM's IT is not secure enough or that TM might not be trustworthy. Generally there is a discomfort about storing the kind of health data that is transmitted to TM (i.e. through the diagnosis tool).

At the same time, TM could also be a role model in terms of IT security and a role model for privacy. If this was the case, privacy could be a core value asset for TM. An interesting value potential for TM is that some people are shy about their health condition and could be offered an anonymous chat about their condition (consider for instance someone who might be afraid of being HIV positive).

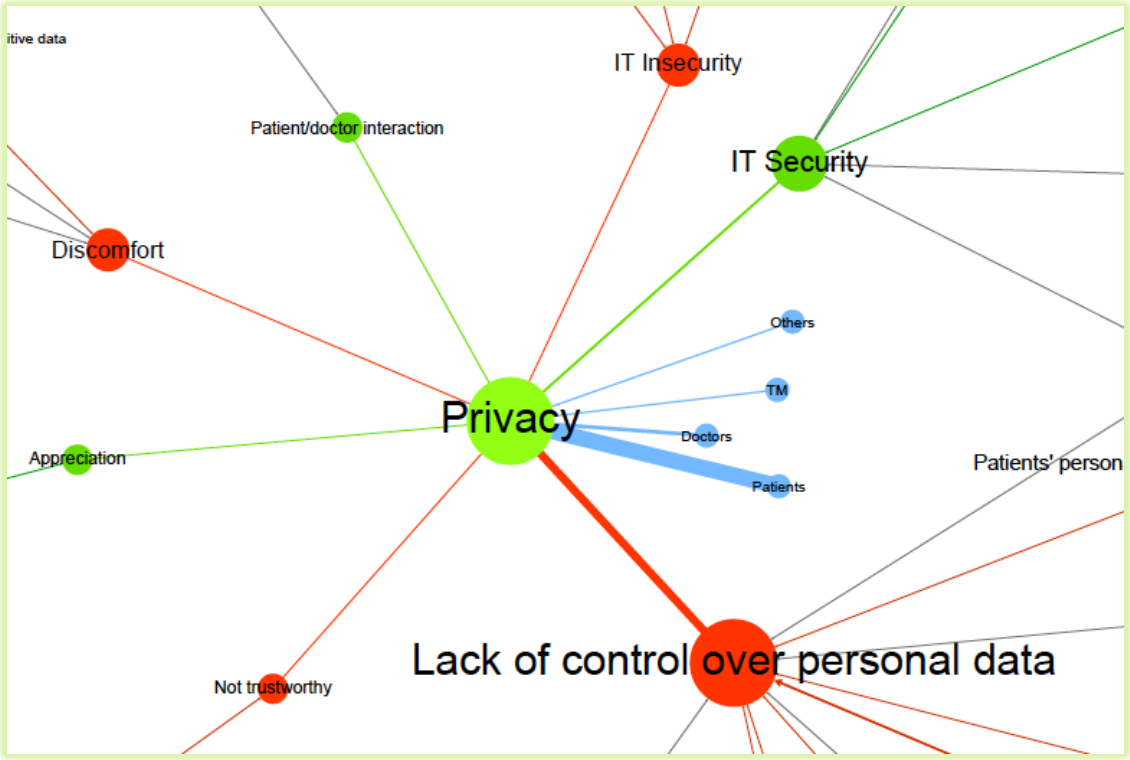


Figure 6b: Privacy (Core Value & Value Qualities)

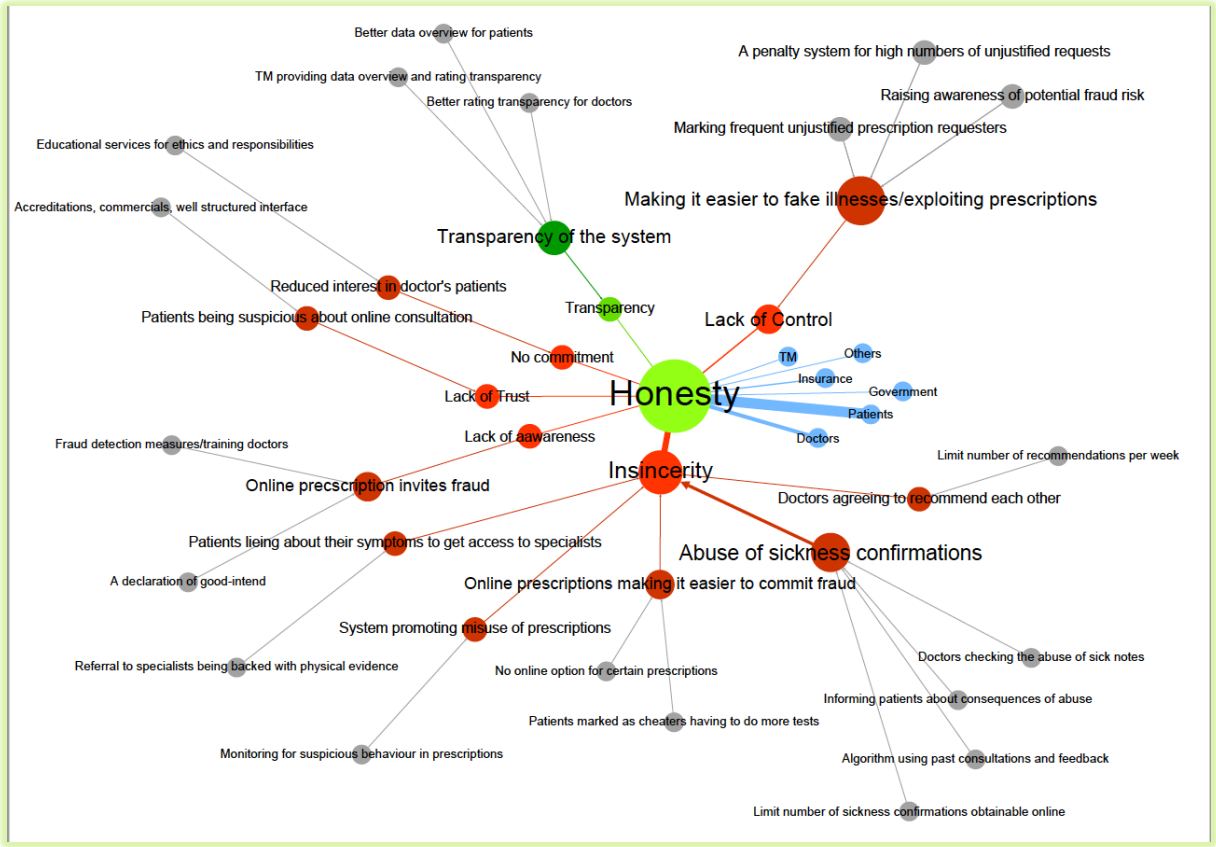
Core value: Privacy

Positive value quality potentials instrumental to foster privacy: IT security, potential anonymity of a patient

Negative value quality potentials instrumental to undermine privacy: lack of IT security (TM), lack of control (patient), undesired (patient) accessibility of health data for secondary usage purposes

Ethical System Level Value Quality Requirement (EVQR): + - patient security, + patient anonymity, - patient data privacy/control, - patient privacy/accessibility

2.3.5 The Role of Honesty for TM's Business



7a: Honesty (complete value cluster with ideas for operational concept)

Honesty is a core value challenge for TM. Insincerity can breed on the platform if patients get sick leaves or prescriptions too easily from TM doctors. The virtuality of the encounter might lead more patients to lie about their true conditions. But also doctors might become insincere in the way they recommend specialists. They might want to promote friends or take money from doctors who they recommend or recommend each other as a mutual favor. Generally, virtuality of the encounter may lead to less commitment, which then encourages a lack of honesty. Patients perceiving this to happen lose trust in the platform. TM will want to avoid this core value problem of honesty by creating maximum transparency on the platform on all kinds of transactions it engages in.

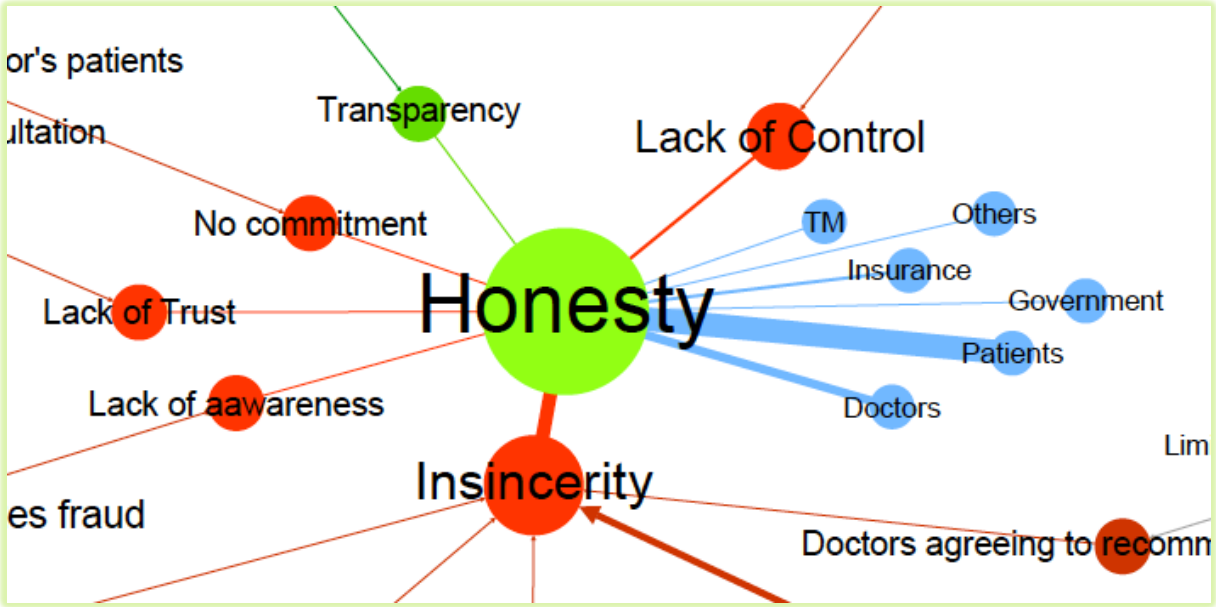


Figure 7b: Honesty (Core Value & Value Qualities)

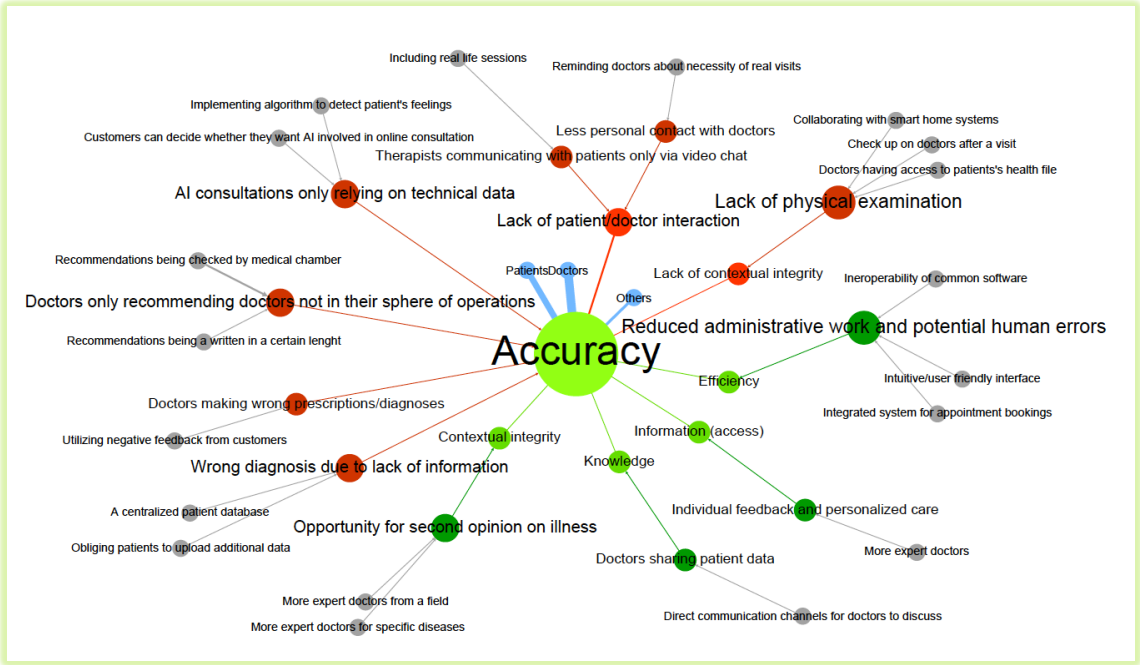
Core value: Honesty

Positive value quality potentials instrumental to foster honesty: transparency

Negative value quality potentials instrumental to undermine honesty: - insincerity of patients, - insincerity of doctors, - lack of trust of patients, - lack of doctor-patient commitment, - lack fo control of TM on what is going on on the platform

Ethical System Level Value Quality Requirement (EVQR): + TM transparency, - patient sincerity, - doctor sincerity, -doctor patient commitment, - TM platform control

2.3.6. The Role of Accuracy for TM's Business



8a: Accuracy (complete value cluster with ideas for operational concept)

Accuracy can be both a potential and a challenge for TM. The accuracy of TM's patient care might be increased because TM has a pool of TM doctors potentially co-operating and exchanging knowledge. The same potential exists for TM's specialist network. Another potential is that TM might offer to keep patient data and build up a history of customer data allowing for some degree of personalized service that is associated with higher health service accuracy.

The negative value qualities associated with accuracy are dominant however. Lack of patient-doctor interaction and lack of physical examination can undermine the accuracy of TM doctors' diagnosis. The diagnosis tool that helps of speed up TM doctor consultation might be suboptimal. The advice in selecting TM specialists might not be accurate; that is: the database of specialists could be inaccurate.

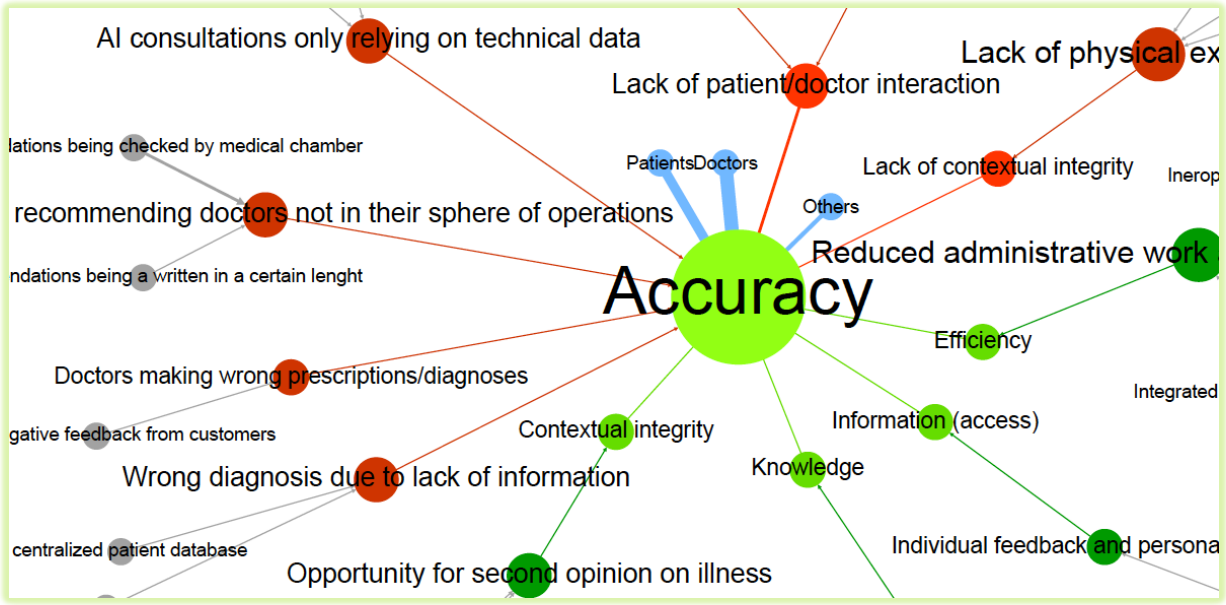


Figure 8b: Accuracy (Core Value & Value Qualities)

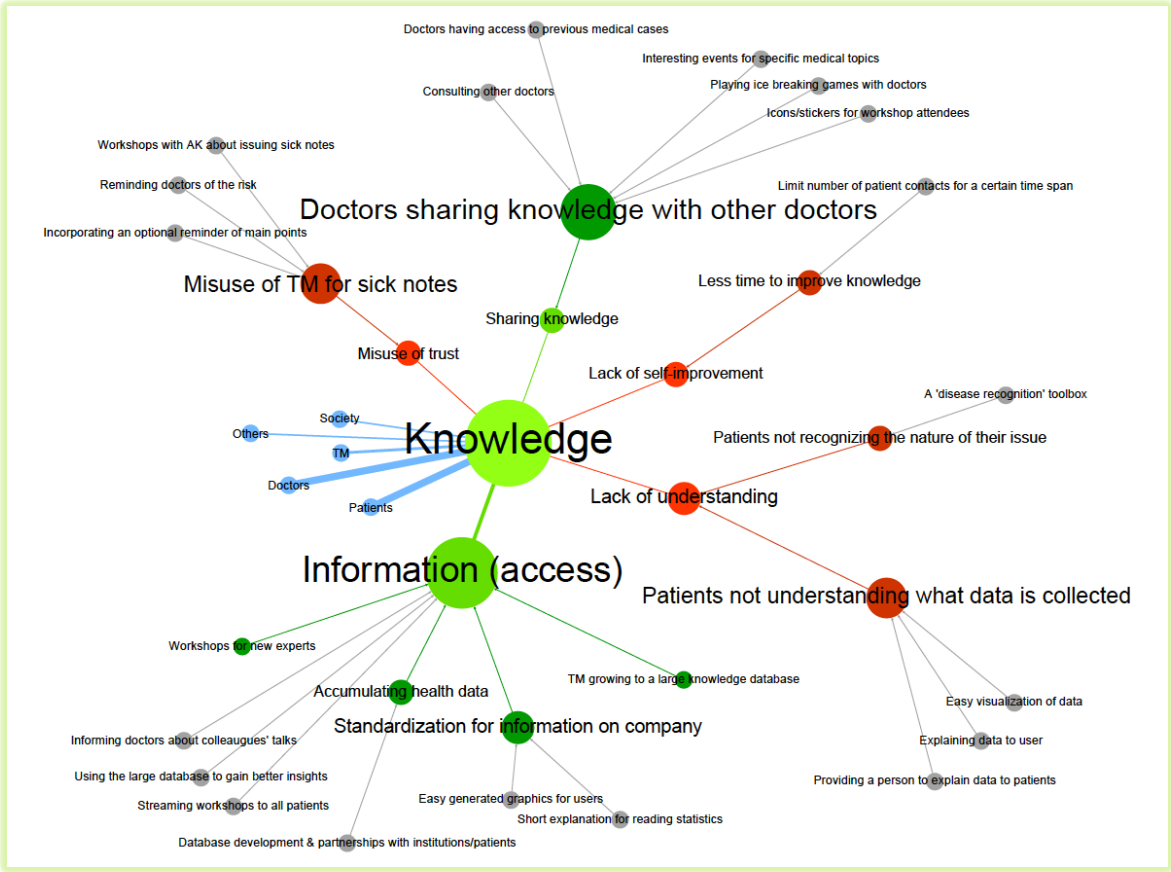
Core value: Accuracy

Positive value quality potentials instrumental to foster accuracy: knowledge exchange between TM doctors, knowledge exchange between TM specialists, efficiency of operations might give more time for accurately treating patients

Negative value quality potentials instrumental to undermine accuracy: lack of quality of specialist database, lack of quality in TM's diagnosis database, virtuality/lack of relationship between patients and TM doctors

Ethical System Level Value Quality Requirement (EVQR): + TM doctor knowledge, + specialist knowledge, + specialist efficiency, - TM data quality, - patient-doctor care/virtuality

2.3.7 The Role of Knowledge for TM's Business



9a: Knowledge (complete value cluster with ideas for operational concept)

Knowledge creation is a huge potential for TM. Because TM collects so much information through the diagnosis process it can build up a knowledge pool not only on specialists, but on everything they learn from customers; both through the talking to patients, as well as through the automatic pre-diagnosis tool. Another even greater potential for TM is that the doctors working for TM and the specialists recommended by TM could exchange knowledge through the TM platform. TM could facility the knowledge exchange by building a community that it also supports through workshops etc.

Knoweldge can be undermined if there is misuse or insincerity on the platform which undermines the collection of valuable data.

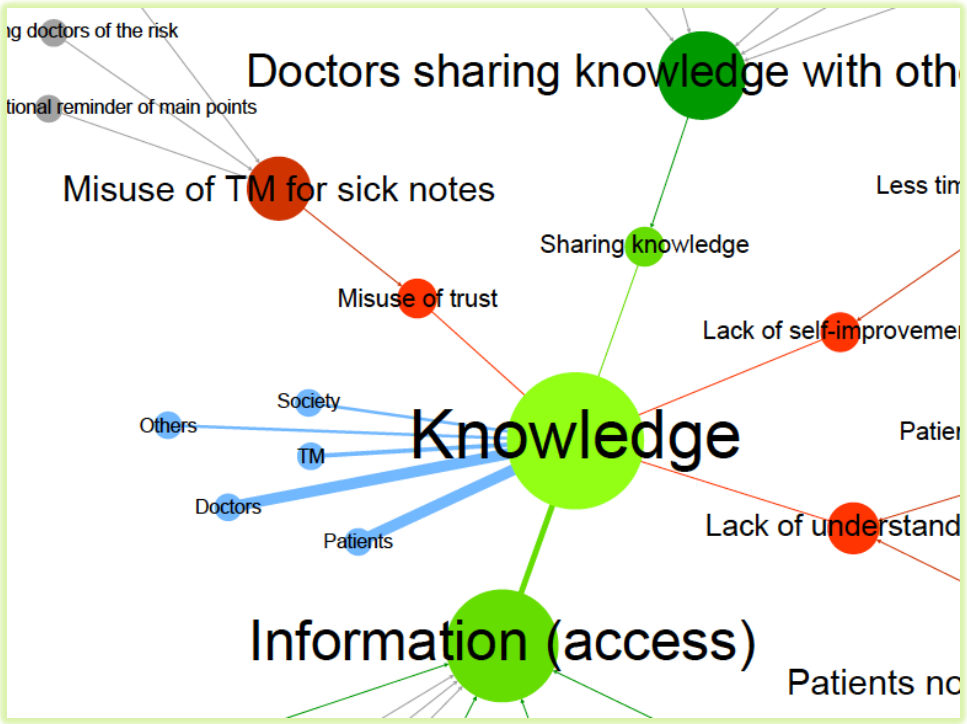


Figure 9b: Knowledge (Core Value & Value Qualities)

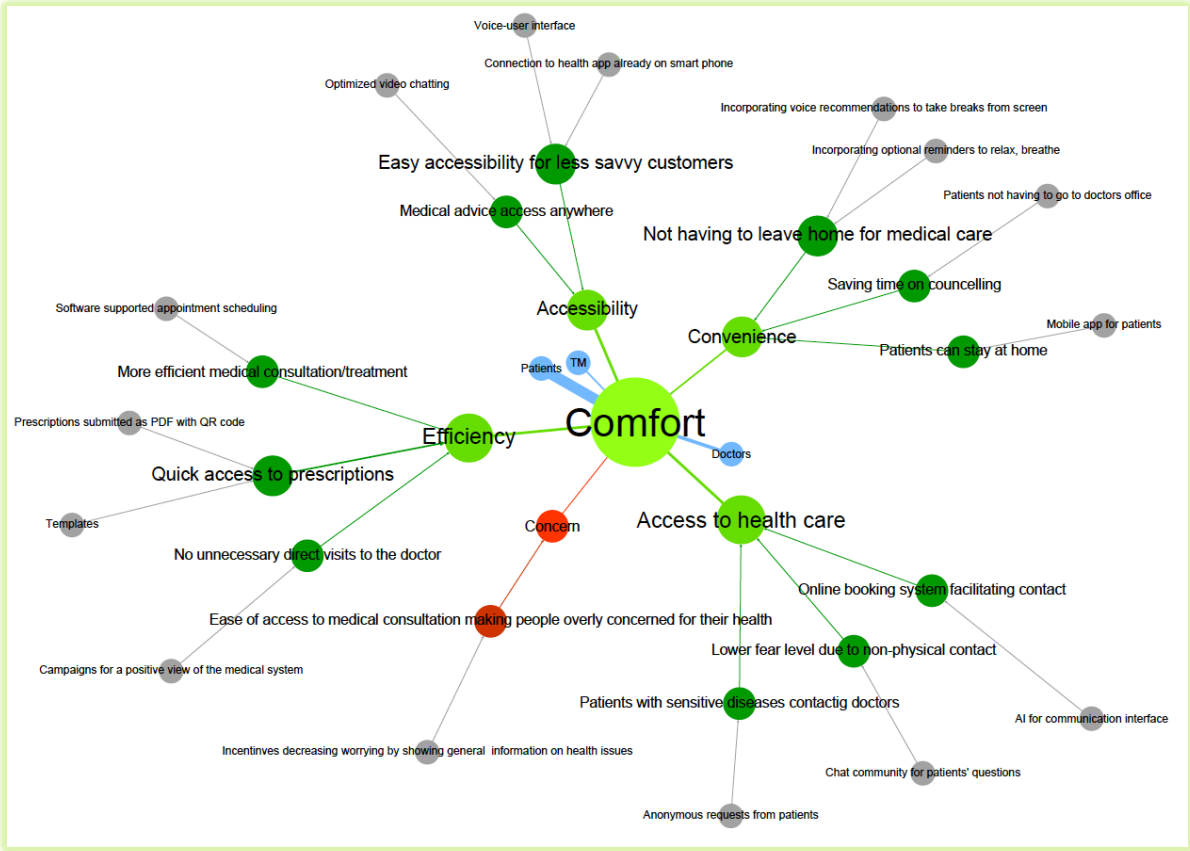
Core value: Knowledge

Positive value quality potentials instrumental to foster knowledge: co-operation between doctors, information sharing between doctors, accessibility to structured health data

Negative value quality potentials instrumental to undermine knowledge: patient insincerity in the sharing of health information lead to suboptimal data quality

Ethical System Level Value Quality Requirement (EVQR): + TM doctor co-operation, + specialist co-operation, + accessibility of health information, - data quality

2.3.8 The Role of Comfort for TM's Business



10: Comfort (complete value cluster with ideas for operational concept)

Comfort is certainly one key value proposition that TM can offer to its patients. The efficiency, convenience and accessibility of the health care service without needing to visit a doctor physically is truly convenient for customers. The drawback could be that the ease of access can make people more concerned about their health; making such a service an instant-to use part of their life (a 'permanent-care' kind of attitude could develop that might be circumscribed with a kind of dependency or addictive behavior today coined hypochondriac).

Core value: Comfort

Positive value quality potentials instrumental to foster comfort: accessibility of service, convenience of service, efficiency of service, patient comfort through virtuality in sensitive matters

Negative value quality potentials instrumental to undermine comfort: patient concern over health is growing and leading to a kind of addiction to permanent care

Ethical System Level Value Quality Requirement (EVQR): + service accessibility, + service efficiency, + patient convenience, + patient comfort, -patient addiction

2.3.9 The Role of Reliability in TM's Business

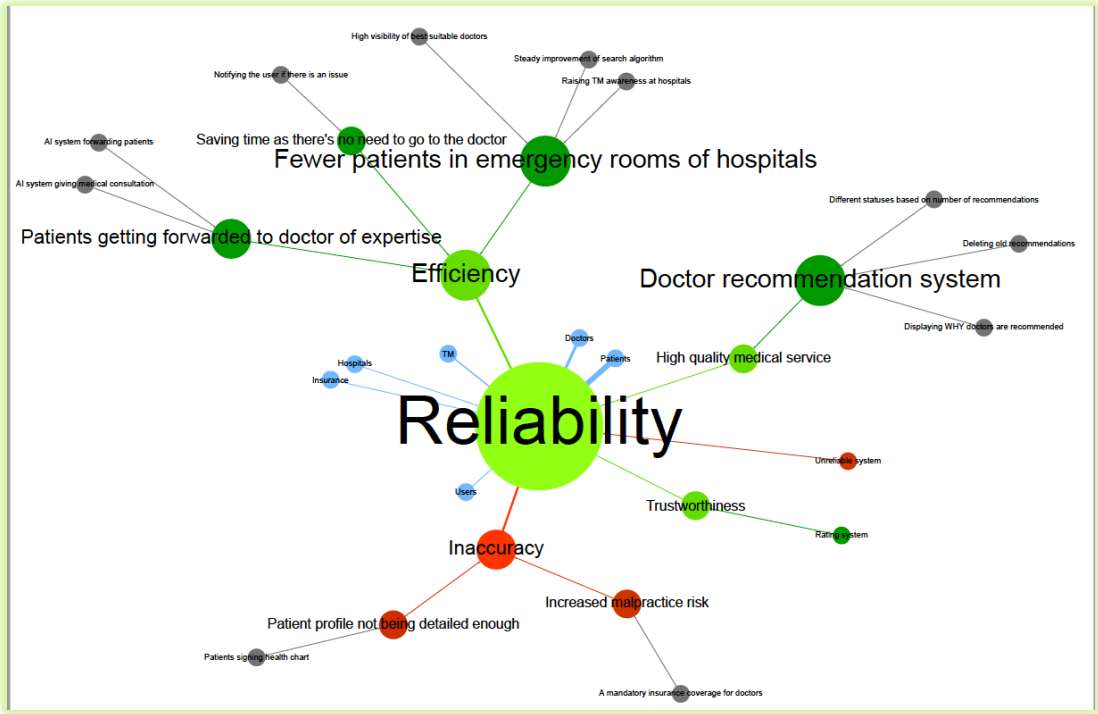


Figure 11: Reliability (complete value cluster with ideas for operational concept)

Reliability is a core value TM needs to offer. It is dependent on the efficiency of the service, its trustworthiness and the high quality of the medical service result from recommending the right specialists. It can be undermined if the data TM holds about patients and specialists is inaccurate. Reliability as a value is strongly interdependent with the other values described already above.

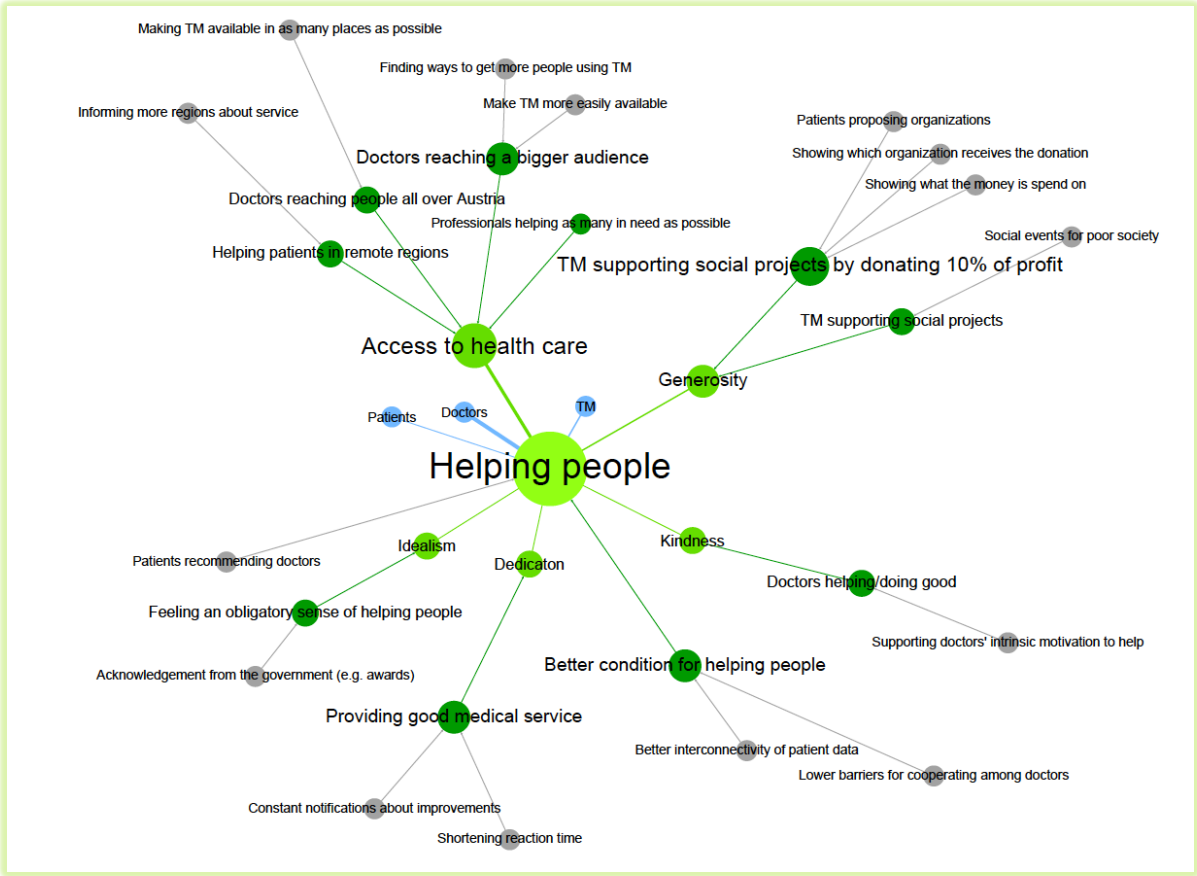
Core value: Reliability

Positive value quality potentials instrumental to foster reliability: + TM's service efficiency, TM specialist recommendation quality, TM trustworthiness in recommending the right specialist

Negative value quality potentials instrumental to undermine reliability - addiction of patients, - TM data quality on patients

Ethical System Level Value Quality Requirement (EVQR): + service efficiency, + service quality, - patient addiction, - TM patient data quality

2.3.10 The Role of Help in TM's Business



12: Help (complete value cluster with ideas for operational concept)

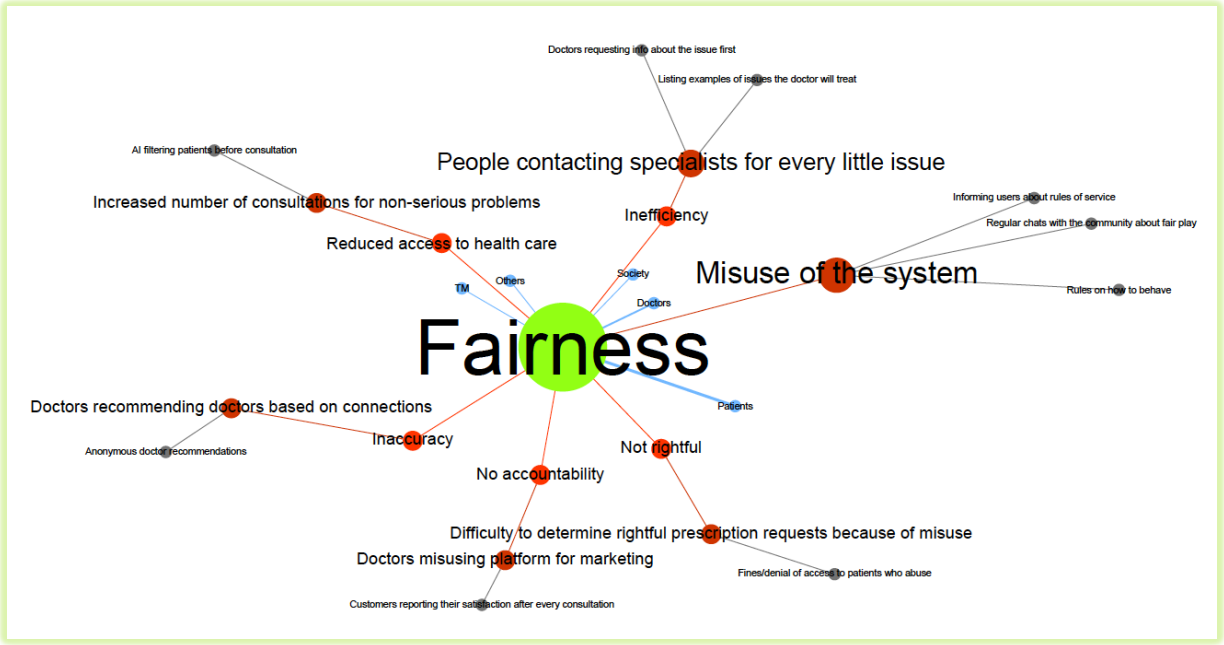
The value of help could be a core asset for TM. The company has indicated in its business plan that it wants to be generous by giving 10% of its profit to social projects. But the value of help is really fostered by TM providing accessibility to health services where these are normally difficult to get, such as in remote regions and – through its mediation – giving doctors the possibility to potentially reach a bigger audience (for instance if there is a good specialist somewhere who would normally not be as visible). A vital part for nourishing the value of help is an attitude of idealism, dedication and kindness among TM doctors.

Core value: Help

Positive value quality potentials instrumental to foster help: accessibility of health care system, attitude of generosity, kindness, dedication and idealism

Ethical System Level Value Quality Requirement (EVQR): + specialist accessibility

2.3.11 The Role of Fairness in TM's Business



13: Fairness (complete value cluster with ideas for operational concept)

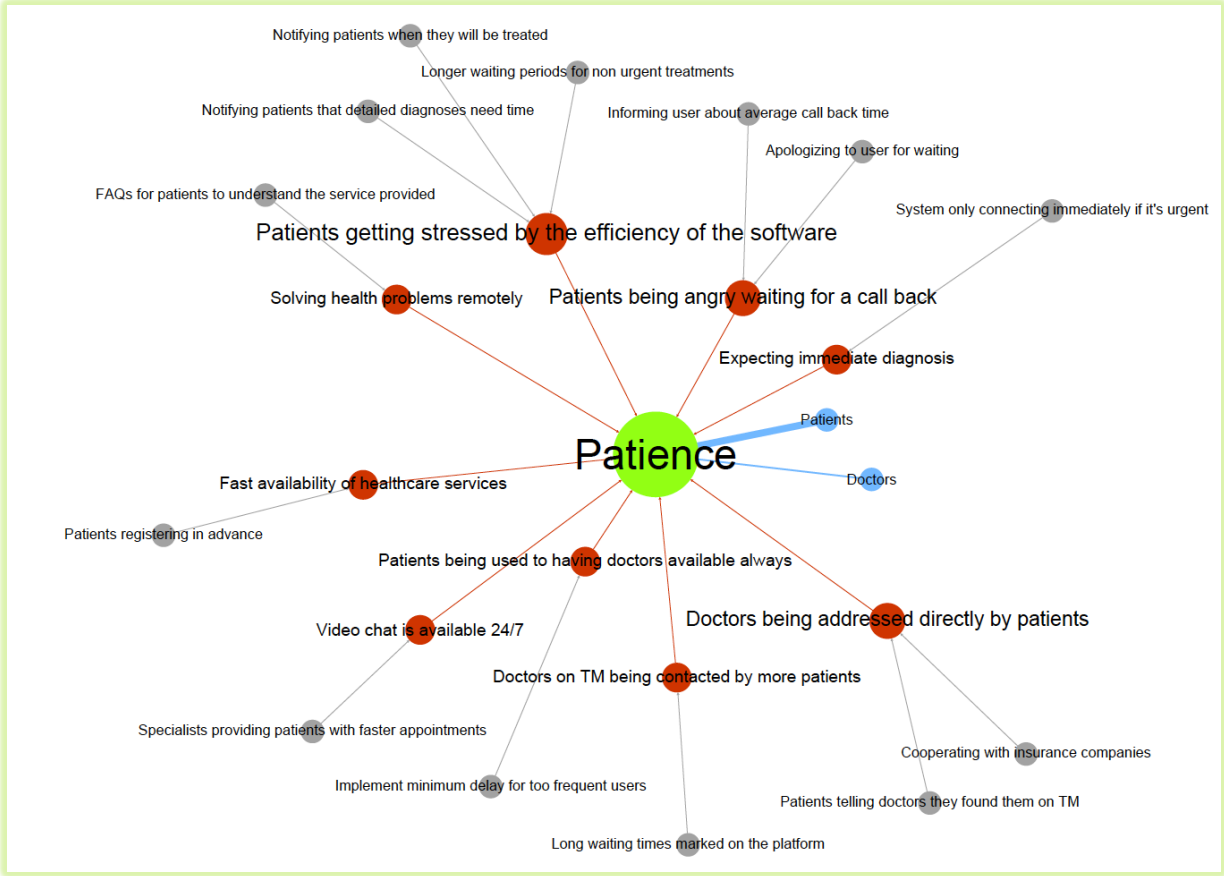
The core value of fairness has been associated with many negative value qualities already described for other core values. The misuse of the system, people contacting it for all kinds of little issues and blocking the line and consultation for others who really have issues can lead to unfair treatment of those who are really in need. Insincere recommendations between doctors, where good doctors might be excluded; doctors misusing TM for getting more marketing than others; these are all aspects associated with a lack of fairness.

Core value: Fairness

Negative value quality potentials instrumental to foster help: specialist inaccessibility or unreachability for patients in true need, patient addiction, TM doctor inaccessibility or unreachability for patients in true need, doctor sincerity leading to exclusion of good specialist, unfair enrichment of doctors on TM platform

Ethical System Level Value Quality Requirement (EVQR): - specialist reachability, - TM doctor reachability, - recommendation sincerity, - TM doctors enrichment

2.3.12 The Role of Patience in TM's Business



14: Patience (complete value cluster with ideas for operational concept)

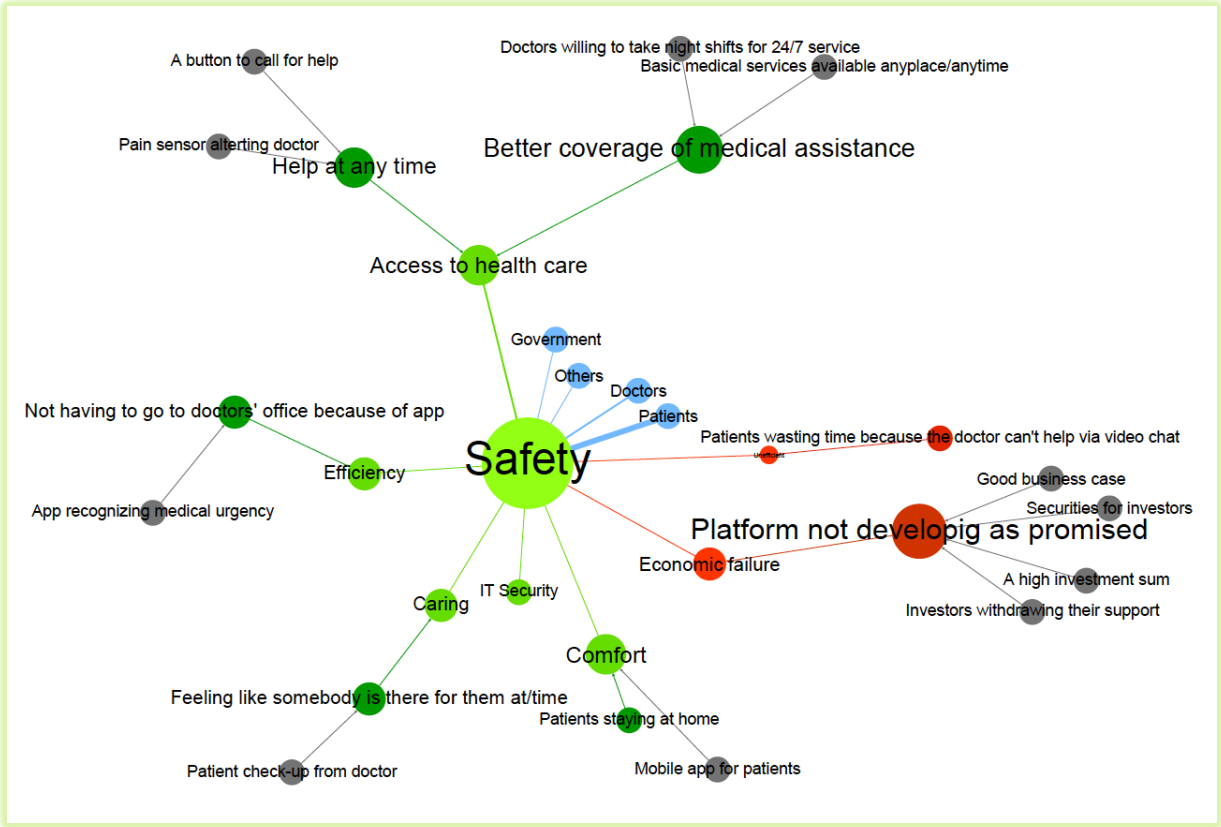
The virtue of patience can suffer through a service like TM. As the word "patience" related to "patient" suggests, being a patient today involves patience. And this exactly this patience which is undermined by the kind of instant access to health service that is being offered by TM. Patients who get used to TM expect fast availability of the service and doctors 24/7, immediate diagnosis, quick fixes to their problems. And they build up the belief that they can access doctors directly. If efficiency and availability does not meet their expectations they might get angry or stressed.

Core value: Patience

Negative value quality potentials instrumental to undermine patience: the instant availability of the TM service that people get used to, remote solutionism, unwarranted availability expectation, unwarranted addressability of doctors

Ethical System Level Value Quality Requirement (EVQR): - availability, - addressability, - solutionism

2.3.13 The Role of Safety in TM's Business



15: Safety (complete value cluster with ideas for operational concept)

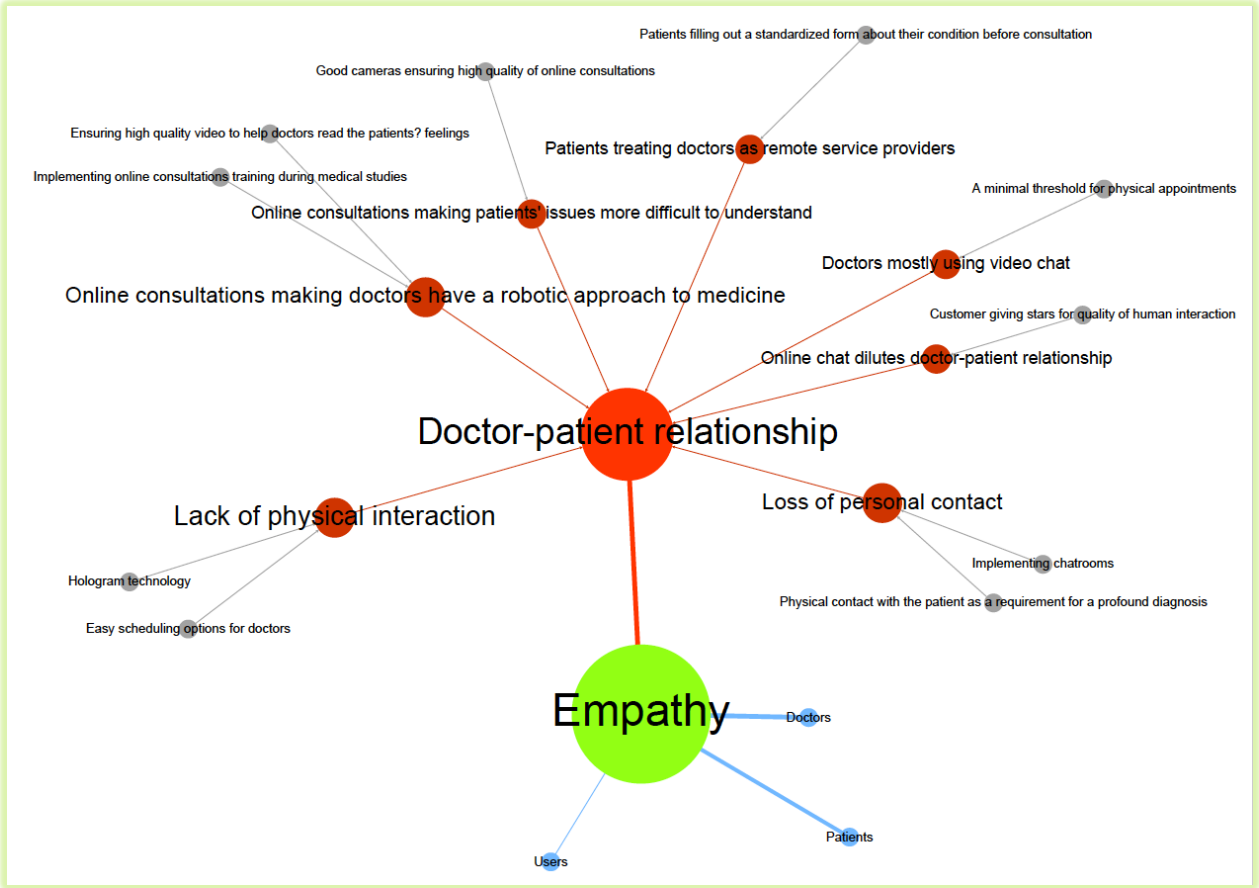
The TM platform has the potential to increase the safety of patients, because it provides the instant access to help and also improves the coverage of medical service in a country. Also the efficiency and comfort is central to quite a few patients who would e otherwise have a difficulty seeing the doctor. The perception of safety increases in a country through such a service. If the platform does not develop as hoped, investors money is not safe.

Core value: Safety

Positive value quality potentials instrumental to foster safety: accessibility of health care, especially of TM doctors and specialists through the country, the efficiency of reach, the perception of care and comfort

Ethical System Level Value Quality Requirement (EVQR): + specialist accessibility, + service availability, TM doctor reachability, + patient comfort

2.3.14 The Role of Empathy in TM's Business



16: Empathy (complete value cluster)

Empathy is a value threatened by TM. This is because the relationship between doctors and patients could change. This is due to the lack of physical interaction between doctors and patients. Doctors could develop a 'robotic' approach to treating patients. And patients in their turn start treating doctors as pure 'service providers'. There would be a loss of personal contact and hence mutual care.

Core value: Empathy

Negative value quality potentials instrumental to undermine empathy: a loss of relationship between doctor and patient

Ethical System Level Value Quality Requirement (EVQR): - patient-doctor care/virtuality, -doctor patient commitment

Summary of Value Clusters with Core Values and Value Qualities

Positive value qualities that can drive a core value	Core Values at Stake			
Specialist quality	Trust	realiability		
TM accuracy	Trust			
TM accountability	Trust			
TM availability	Trust	safety		
Patient inclusion	Equality			
Specialist accessibility	Equality	Efficiency	help	safety
TM consultation effectiveness	Efficiency			
Patient data security	privacy			
Patient anonymity	privacy			
TM transparency	honesty			
TM doctor knowledge	accuracy			
Specialist knowledge	accuracy			
Specialst efficiency	accuracy			
Co-operation between TM doctors	knowledge			
Co-operation between specialists	knowledge			
Accessibility of health information	knowledge			
Patient data quality	knowledge			
TM service asscessibility	comfort	safety		
TM service efficiency	comfort	reliability		
Patient convenience	comfort			
Patient comfort	safety			
Negative Value qualities that can undermine a core valu	**Core Values at Stake**			
Patient insincertiy	Trust	Honesty		
Lack of TM doctor accountabiltiy	Trust			
Specialist exhaustion	Trust			
Lack of Doctor co-operation	Trust			
Lack of patient-doctor relationship stability/virtuality	Trust			
Lack of patient-doctor care/virtuality	Trust	Equality	accuracy	empathy
Lack of patient doctor commitment/virtuality	Honesty	empathy		
Lack of patient inclusion	Equality			
Specialist accessibility	Efficiency			
TM doctor overload	Efficiency			
Lack of patient data security	privacy			
Lack of patient data control	privacy			
Lack of specialist recommendation sincerity	honesty	fairness		
TM platform control	Honesty			
TM data quality	Accuracy	reliability		
Patient addiction	comfort	reliability		
Specialist reachability	fairness			
TM doctor reachability	fairness	patience		
TM doctor enrichment	fairness			
TM doctor quick addessability	patience			
Solutionims culture	patience			

Table 2: Value qualities and the core values they cater to (green positive value qualities, orange negative value qualities)

3 Value Prioritization

(artefacts of the Value Prioritization Process, IEEE P7000, Section 10)

The core value clusters were prioritized with TM's CEO. The process for doing so was that the CEO combined value clusters and arranged them to build a coherent story for his business; a **value-based strategy narrative or "description"**.

In a first discussion with TM (in line with IEEE P7000 10.5.1.1) it became clear that the primary ethical principle of TM was that of equality: "*Everyone should have access to a good specialist"* was the core statement. The desire to help people was the primary concern of the business founders.

When engaging in value cluster prioritization (in line with IEEE P7000 10.5.1.2) the CEO made clear that making money was not his highest priority. The value clusters for empathy, fairness and efficiency ended up at the outer boundaries of the CEO's value space and would therefore be placed at the lowest end of value prioritization.

That said, equality was not the only value-based strategy value elicitation resulted in.

Value analysis resulted in three different opportunities:

1. A knowledge-based value strategy,
2. A comfort-based value strategy and
3. The equality-based value strategy TM finally preferred.

The following sections show how – depending on the value strategy - operational and technical priorities change for TM.

3.1. Value prioritization for a knowledge-based strategy (recommended by WU)

During preparation of value clusters the value experts initially identified one potential value based system strategy for TM coined the "knowledge strategy" (figure 17).

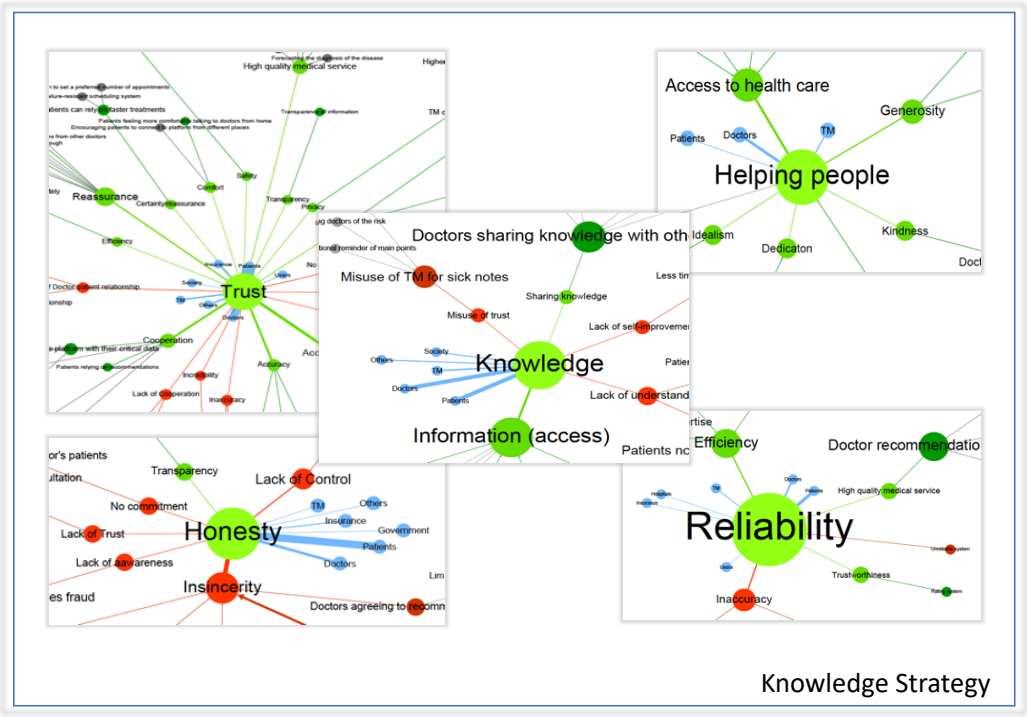


Figure 17: Value based strategy for TM putting the value of knowledge at the center

This knowledge strategy would mean that the telemedicine platform would be turned into a service that does not only serve patients, but also doctors. TM doctors could engage in regular knowledge exchange. TM specialists could use the platform to exchange knowledge and expert opinion and help each other in diagnosis. This is especially important in helping people that are living in rural regions and might not have access to the best hospitals and specialists. Such a knowledge strategy that leads to a strong doctor community can only work if there are high quality specialists in the TM community that can support others effectively and if this support is organized efficiently with the help of TM's platform. An ideal for the operational concept voiced by stakeholders was to share diagnosis data between doctors for mutual help. Patient data quality would need to be of highest standard for such a value strategy. Table 3 summarizes how value clusters, that is the respective core values and their value qualities would be prioritized if the company followed the knowledge strategy.

Knowledge based TM Strategy: Prioritization of Value Clusters	
Knowledge	Co-operation between TM doctors
Knowledge	Co-operation between specialists
Knowledge	Accessibility of health information
Knowledge	Patient data quality
Reliability	Specialist quality
Reliability	TM service efficiency
Reliability	Patient addiction
Accuracy	TM data quality
Accuracy	TM doctor knowledge
Accuracy	Specialst efficiency
Privacy	Lack of patient data security
Privacy	Lack of patient data control
Privacy	Patient data security
Privacy	Patient anonymity
Trust	Patient insincertiy
Trust	Lack of TM doctor accountabiltiy
Trust	Specialist exhaustion
Trust	Lack of patient-doctor relationship stability/virtuality
Trust	Lack of patient-doctor care/virtuality
Trust	Lack of Doctor co-operation
Trust	TM accuracy
Trust	TM accountability
Trust	TM availability
Honesty	Lack of patient doctor commitment/virtuality
Honesty	Lack of specialist recommendation sincerity
Honesty	TM platform control
Honesty	TM transparency
Equality	Patient inclusion
Equality	Specialist accessibility
Equality	Lack of patient inclusion
Other Core Values and Value Qualities for later Roadmap	
Efficiency	TM consultation effectiveness
Efficiency	Specialist accessibility
Efficiency	TM doctor overload
Patience	TM doctor quick addessability
Patience	Solutionims culture
Comfort	TM service asscessibility
Comfort	Patient convenience
Safety	Patient comfort
Fairness	Specialist reachability
Fairness	TM doctor reachability
Fairness	TM doctor enrichment

Table 3: Value prioritization for TM knowledge strategy

3.2. Value prioritization for TM's comfort-based strategy

A second available value-based strategy initially developed by TM's CEO was what was coined the "comfort strategy" as depicted in figure 18. A comfort strategy would be a relatively high-cost-quality strategy for TM with the goal to be the first-tier health relationship for patients. The goal would be to have patients see TM as their first-tier health provider that they can turn to at any time, in an efficient way and at maximum convenience. Negatively speaking there is a possibility that patients might get addicted to be constantly cared for by TM on the spot when they do not feel well. For this reason, patience is also a challenge for TM in this service scenario. Patients might unlearn to wait (be patient) and develop a solutionism attitude towards the medical discipline. If TM wanted to pursue this strategy the core values of safety, privacy and help would need to be nourished on the platform. Patients would expect reliability. Honesty could become a threat for TM, because wanting to maintain a strong bond with patients might imply that patients expect to get 'help' with quick prescriptions, sick notifications, etc. at any time; effectively undermining the trustworthiness of the platform. This trustworthiness is however central for TM in this value-based strategy, because patients only feel comfortable to choose TM as their first-their provider if TM is accountable, available and accurate and succeeds in overcoming the drawbacks of virtual video-encounters; for instance by offering physical visits to their premises as well.

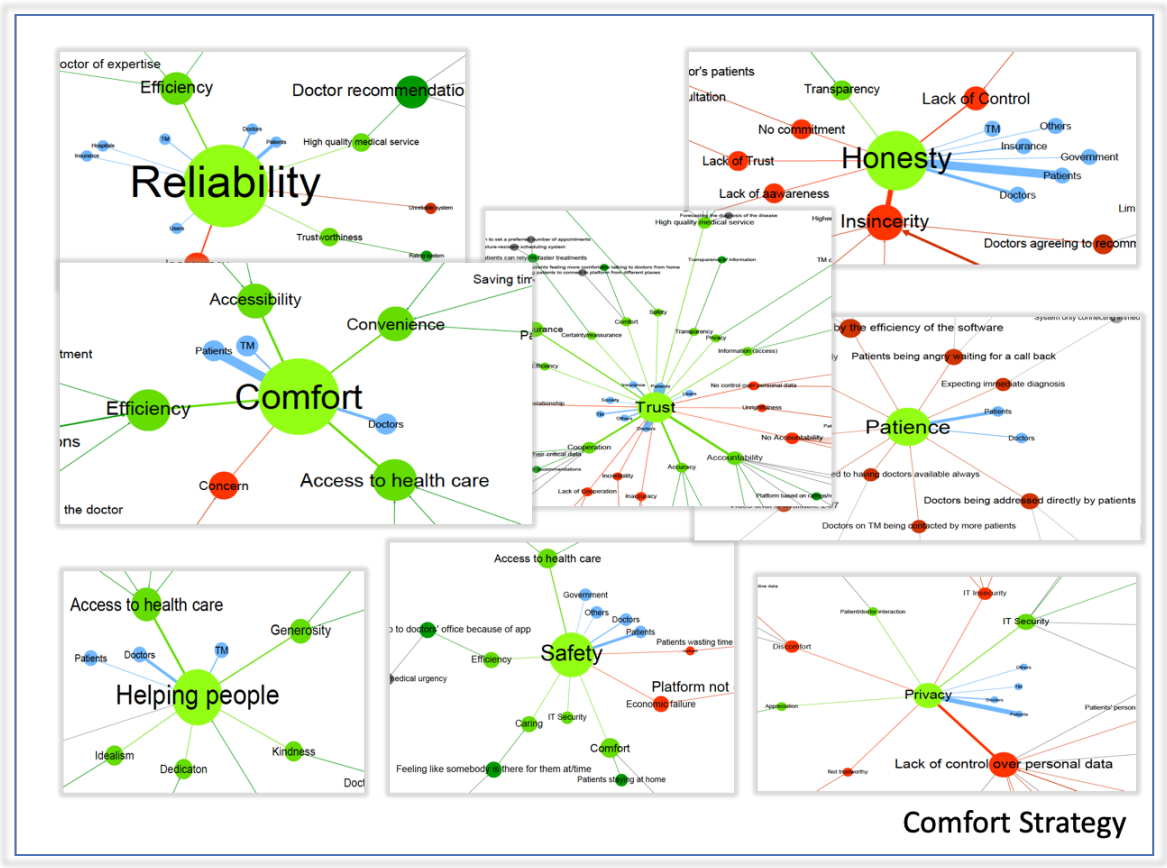


Figure 18: Value based strategy for TM putting the value of comfort at the center

Comfort based TM Strategy: Prioritization of Value Clusters	
Comfort	Patient addiction
Comfort	TM service asscessibility
Comfort	TM service efficiency
Comfort	Patient convenience
Trust	TM accuracy
Trust	TM accountability
Trust	TM availability
Trust	Patient insincertiy
Trust	Lack of TM doctor accountabiltiy
Trust	Specialist exhaustion
Trust	Lack of Doctor co-operation
Trust	Lack of patient-doctor relationship stability/virtuality
Trust	Lack of patient-doctor care/virtuality
Trust	Specialist quality
Safety	Patient comfort
Privacy	Patient data security
Privacy	Patient anonymity
Privacy	Lack of patient data security
Privacy	Lack of patient data control
Patience	TM doctor quick addessability
Patience	Solutionims culture
Honesty	Lack of specialist recommendation sincerity
Honesty	TM platform control
Honesty	Lack of patient doctor commitment/virtuality
Honesty	TM transparency
Other Core Values and Value Qualities for later Roadmap	
Equality	Lack of patient inclusion
Equality	Specialist accessibility
Equality	Patient inclusion
Knowledge	Co-operation between TM doctors
Knowledge	Co-operation between specialists
Knowledge	Accessibility of health information
Knowledge	Patient data quality
Accuracy	TM doctor knowledge
Accuracy	Specialist knowledge
Accuracy	Specialst efficiency
Accuracy	TM data quality
Efficiency	Specialist accessibility
Efficiency	TM doctor overload
Efficiency	TM consultation effectiveness
Fairness	Specialist reachability
Fairness	TM doctor enrichment
Fairness	TM doctor reachability

Table 4: Value prioritization for TM comfort strategy

3.3. Value prioritization for TM's equality-based strategy

The third available value-based strategy for TM is an equality-based strategy as depicted in figure 19. This strategy is all about inclusion. It wants to ensure that everyone has access to a good specialist. This implies that specialists also need to be accessible for patients that are recommended by TM. There would be no benefit from TM recommending people to a specialist if that specialist was not available or too expensive for a patient to afford. So TM needs to have a pool of effectively accessible, available specialists.

Striving for inclusion and equality also implies that TM needs to build a relationship of trust between TM doctors and patients; that is TM needs to convince patients through its service that TM doctors *care* for them to find the right specialist. Unlike the comfort strategy it is, however, not TM's goal to become a full first-tier provider having a deep relationship of comfort with the respective patient.

In the equality strategy TM sees itself only as a reliable and trustworthy mediator; a a helping hand that then passes the patient on to the right address. Building trust is key though for TM in this strategy as well. TM must ensure that the specialists it recommends are really of good quality. It needs to be accurate about this quality and perceive itself as accountable for the advice it gives.

Equality also implies that TM must be available for any kind of patient; not restricting availability to privately ensured people only. Very poor people or immigrants might not have any insurance and an inclusive equality-based strategy would imply that TM still helps them as well.

A challenge for TM in this value strategy is that the virtual character of the chat-interface might lead to a loss of accountability among TM personnel (i.e. its doctors) as well as to patient insincerity (abusing the platform and abusing TM's effort). The specialists who are recommended might also get overwhelmed by patients flocking in from TM. And finally there is the risk that TM is promoting a small subset of specialists so much that its practice breeds envy against those that are being recommended. TM's platform – if it succeeds – may undermine doctors' current willingness to freely recommend each other or good specialists. If doctors became dishonest about recommending the right specialists (due to envy or other ties), then TM's mission would not be fulfilled. Therefore, being "just an intermediary", TM must ensure that its network of stakeholders remains honest and co-operative in its mutual effort to provide the best service to everyone.

Platform transparency and control; i.e. the question how recommended specialists are chosen in the first place and by whom they were

recommended should be made transparent to ensure long-term platform trust.

Finally, because TM will have a rather neutral customer relationship, but still exchange health data with people, privacy standards must be high in this scenario.

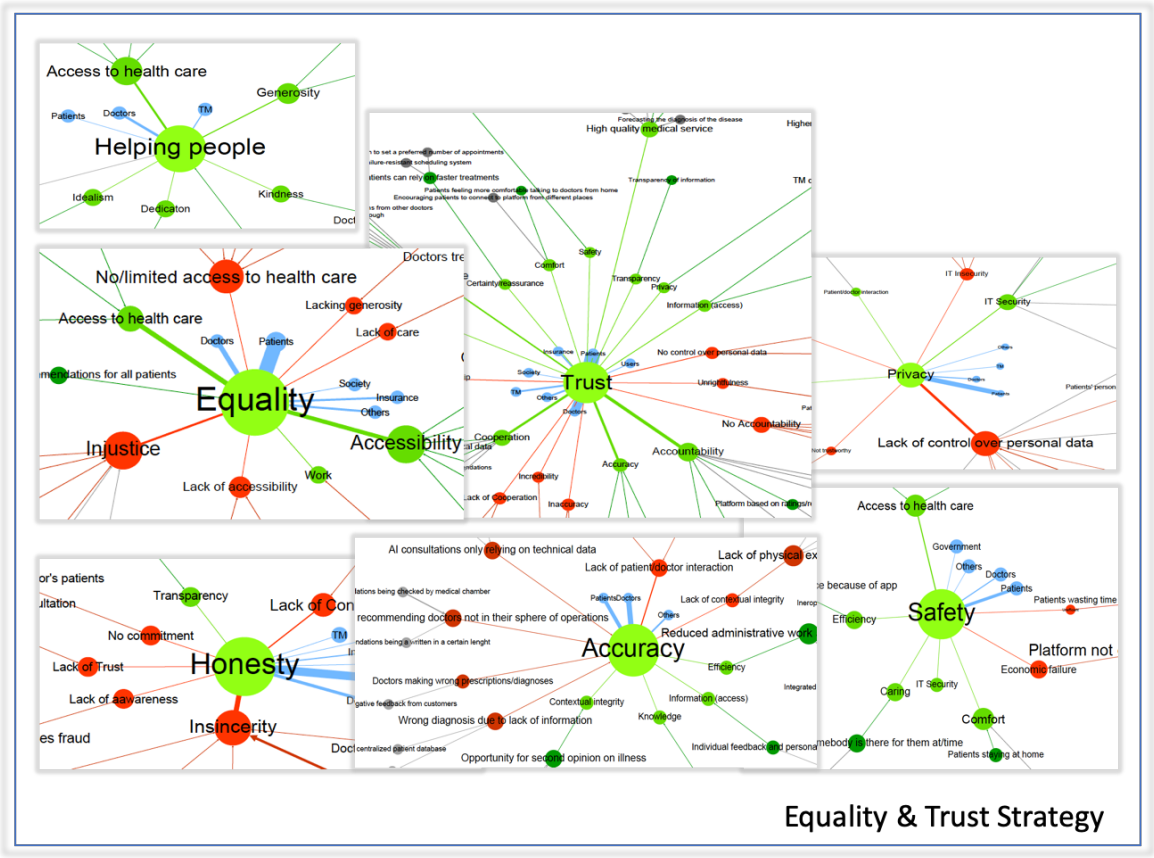


Figure 19: Value based strategy for TM prioritizing the value of equality and trust at the center

Equality based TM Strategy: Prioritization of Value Clusters	
Equality	Patient Inclusion
Equality	Specialist accessibility
Equality	Lack of patient inclusion
Equality	Lack of patient-doctor care/virtuality
Trust	Specialist quality
Trust	TM accuracy
Trust	TM accountability
Trust	TM availability
Trust	Patient insincerity
Trust	Lack of TM doctor accountabiltiy
Trust	Specialist exhaustion
Trust	Lack of Doctor co-operation
Trust	Lack of patient-doctor relationship stability/virtuality
Accuracy	TM doctor knowledge
Accuracy	Specialist knowledge
Accuracy	Specialst efficiency
Accuracy	TM data quality
Honesty	Lack of patient doctor commitment/virtuality
Honesty	Lack of specialist recommendation sincerity
Honesty	TM platform control
Honesty	TM transparency
Privacy	Patient data security
Privacy	Patient anonymity
Privacy	Lack of patient data security
Privacy	Lack of patient data control
Safety	TM service asscessibility
Safety	Patient comfort
Other Core Values and Value Qualities for later Roadmap	
Fairness	Specialist reachability
Fairness	TM doctor reachability
Fairness	TM doctor enrichment
Efficiency	Specialist accessibility
Efficiency	TM doctor overload
Efficiency	TM consultation effectiveness
Comfort	TM service efficiency
Comfort	Patient convenience
Comfort	Patient addiction
Patience	TM doctor quick addessability
Patience	Solutionims culture
Knowledge	Co-operation between TM doctors
Knowledge	Co-operation between specialists
Knowledge	Accessibility of health information
Knowledge	Patient data quality

Table 5: Value prioritization for TM equality strategy

Re-arranging value priorities based on international agreements and regulation

In line with TM's initial business mission to provide everyone with a good doctor, the equality-based value strategy has been chosen by TM to move forward.

There are no international agreements that would contradict the value qualities that are forming this equality based company strategy. However, since TM operates in the health industry and since health data is associated with strong privacy and security regulation the value experts needed to consult these regulations in line with IEEE P7000 section 10.5.2. In line with IEEE P7000 10.5.3.1 the order of value quality priorities then needed to be adjusted for privacy and security legislation. That is: the value of privacy was put even before the value of trust; including all its value qualities to be considered. As the European General Data Protection Regulation contains the principle of data quality that stakeholders equally recognized, this value quality was equally prioritized. The same is true for the value quality of accessibility of health data that TM depends on.

The value challenge TM must address is how to balance health data accessibility and patient privacy concerns with accurate advice that needs some data to work with. These reflections have been leading to a slightly adjusted value priority list that the CEO would then agree on for his business and platform development. The adjusted list is summarized in table 6.

Equality based TM Strategy: Prioritization of Value Clusters		
Core Value	**Value Quality driving Core Value**	**Value Cluster**
Equality	Patient Inclusion	Value Cluster 1: Equality
Equality	Specialist accessibility	
Equality	Lack of patient inclusion	
Equality	Lack of patient-doctor care/virtuality	
Privacy	Patient data security	Value Cluster 2: Privacy
Privacy	Patient anonymity	
Privacy	Lack of patient data security	
Privacy	Lack of patient data control	
Accuracy	TM data quality	
Knowledge	Patient data quality	
Knowledge	Accessibility of health information	
Trust	Specialist quality	Value Cluster 3: Trust
Trust	TM accuracy	
Trust	TM accountability	
Trust	TM availability	
Trust	Patient insincerity	
Trust	Lack of TM doctor accountabiltiy	
Trust	Specialist exhaustion	
Trust	Lack of Doctor co-operation	
Trust	Lack of patient-doctor relationship stability/virtuality	
Honesty	Lack of patient doctor commitment/virtuality	Value Cluster 4: Honesty
Honesty	Lack of specialist recommendation sincerity	
Honesty	TM platform control	
Honesty	TM transparency	
Accuracy	TM doctor knowledge	Value Cluster 5: Accuracy
Accuracy	Specialist knowledge	
Accuracy	Specialst efficiency	
Safety	TM service asscessibility	Value Cluster 6: Safety
Safety	Patient comfort	
Other Core Values and Value Qualities for later Roadmap		
Fairness	Specialist reachability	
Fairness	TM doctor reachability	
Fairness	TM doctor enrichment	
Efficiency	Specialist accessibility	
Efficiency	TM doctor overload	
Efficiency	TM consultation effectiveness	
Comfort	TM service efficiency	
Comfort	Patient convenience	
Comfort	Patient addiction	
Patience	TM doctor quick addessability	
Patience	Solutionims culture	
Knowledge	Co-operation between TM doctors	
Knowledge	Co-operation between specialists	

Table 6: Re-arranged value quality priority list with privacy inside, duplications sorted out, value clusters identified, which drive the initial value-based system design effort

Ethical Policy Statement

In line with IEEE P7000 10.5.3.4 the value experts then prepared an Ethical Policy Statement to be signed by CEO of TM (10.5.3.5). This statement reads as follows:

"The Company TM's core goal is to create a recommendation platform for specialist doctors that is maximally inclusive for any patient, ensuring that anyone has access to the right specialists. TM cares for the privacy of the patients it interacts with and wants to foster trust, honesty and accuracy on its platform thereby creating a perception of safety in people needing help."

Ethical System Level Value Quality Requirement Identification (EVQR)

(artefacts of the Conceptual Analysis as specified in IEEE P7000, Section 11)

In line with the activities outlined in IEEE P7000 section 11.5.1.1. the value experts excluded from all prioritized value clusters those value qualities from further analysis that TM itself cannot enforce by taking any measures at the organizational or technical level.

By deleting those value qualities which they cannot influence TM's value experts select those value qualities that can be translated into ethical value quality requirements (EVQRs).

EVQRs are organizational or technical system requirements corresponding to a value quality that stakeholders identify as relevant for the SoI

Table 7 shows how EVQR are roughly anticipated for the prioritized value clusters and value qualities.

Equality based TM Strategy: Prioritization of Value Clusters		Qualifies as EVQR?	Details on why Value Quality can or cannot be an EVQR
Equality	Patient Inclusion	✔☐	measures to ensure that all patients are included and none is excluded
Equality	Specialist accessibility	✔☐	measures to ensure that TM patients are treated at fair terms and in time
Equality	Lack of patient-doctor care/virtuality	✔☐	measures to maximize care for any patient and avoid any measure that would lead to unequal treatment c
Privacy	Patient data security	✔☐	measures to improve the data confidentiality, integrity, availability and authenticity of all data handled by
Privacy	Patient anonymity	✔☐	measures to give patients the possibility to stay anomous
Privacy	Lack of patient data control	✔☐	measures to maximize patient control over the data that is recorded through TM
Accuracy	TM data quality	✔☐	measures to guarantee the accuracy, consistency, completness and timeliness of patient data in line with
Knowledge	Accessibility of health information	✔☐	measures to give TM staff the minimum purpose related access to patient data that is required to offer a
Trust	Specialist quality	✔☐	measures to ensure that all specialists recommended by TM are of high quality
Honesty	Lack of specialist recommendation sincerity	✔☐	measures to ensure that specialists are really those who should be recommended
Trust	TM accuracy	✔☐	measures to foster the knowledge and quality of TM doctors and specialists
Trust	TM accountability	✔☐	measures to foster in TM staff a sense of accountability
Trust	TM availability	✔☐	measures to ensure pre-defined availability standards of the TM service
Trust	Patient insincerity	✔☐	measure to minimize the risk of patients engaging in dishonest behavior o the platform and abusing its se
Trust	Specialist exhaustion	no EVQR	if good specialists are overwhelmed today by patients this is something that TM will hardly be able to char
Trust	Lack of Doctor co-operation	no EVQR	if doctors will perceive competition if they are not recommended by TM and this undermines co-operation
Honesty	Lack of patient doctor commitment/virtuality	no EVQR	measures to communicate the need for and nature of mutual commitment despite the virtual interface wo
Honesty	TM transparency and platform control	✔☐	measures to design transactions on the TM platfrom as transparently as possible
Accuracy	TM doctor knowledge	✔☐	measures to ensure that TM doctors are trained and supported in their knowlege
Accuracy	Specialist knowledge	✔☐	measures to ensure that TM doctors are trained and supported in their knowlege
Accuracy	Specialst efficiency	no EVQR	whether a specialist works efficiently is something TM cannot influence
Safety	Patient comfort	no EVQR	here safety is meant as a perception of patients or potential TM users that results from the other values

Table 7: prioritized value clusters and their value qualities are analyzed as to how they might be influenced by the organization

In line with IEEE P7000 11.5.1.2 the value experts then consulted the literature and the law on the respective core values as well as some of the value qualities and conceptually refined the spectrum of value qualities needed to address a core value promise. The result of this analysis is

summarized in figures 20, 21 and 22. Note that the conceptual completion of a core value like privacy or trust already embraces many value qualities identified for other core values like honesty or accuracy. So the final three figures consolidate value clusters and value qualities and give an overview of the company's final value quality concerns.

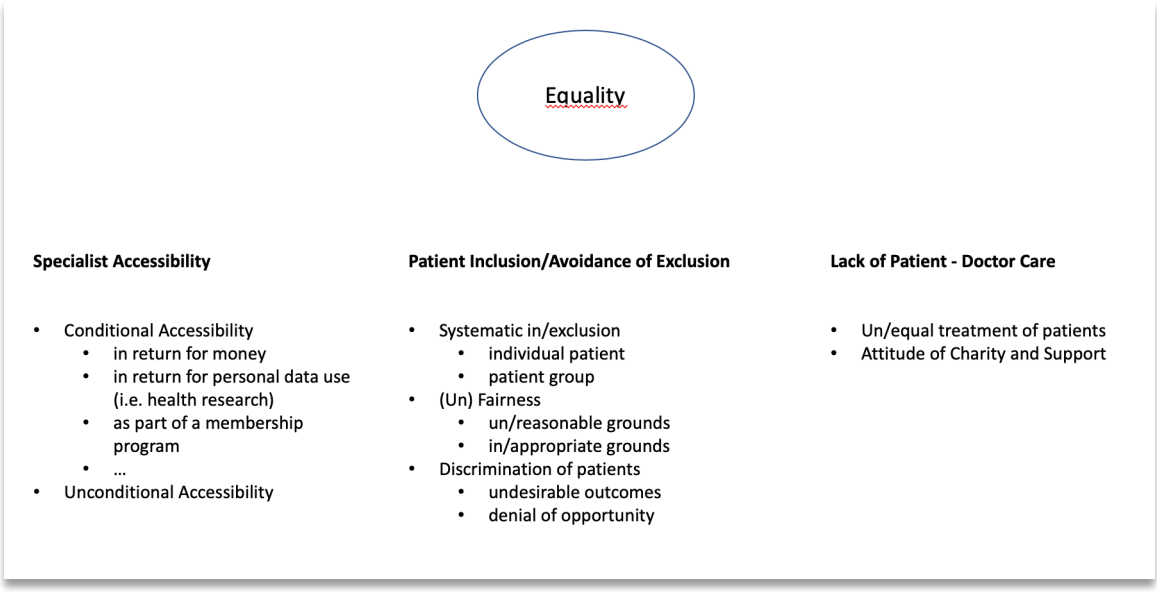


Figure 20: Result of the Conceptual Analysis and Refinement of the value "equality" for TM's operational context

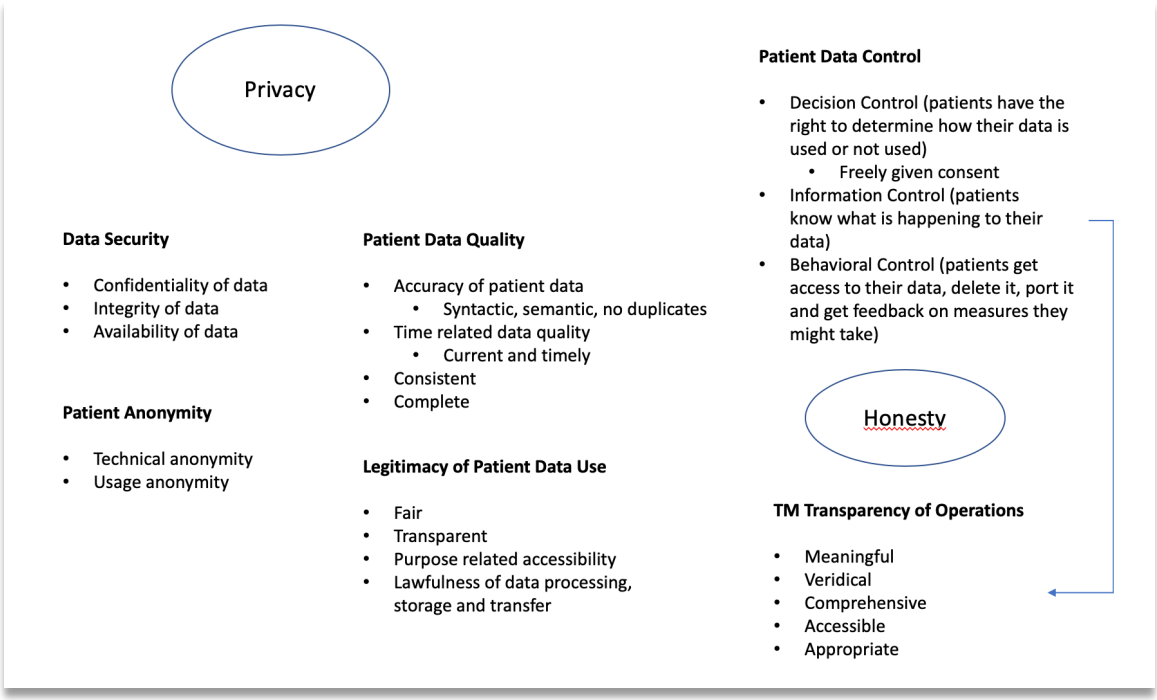


Figure 21: Result of the Conceptual Analysis and Refinement of the values "privacy and honesty" for TM's operational context

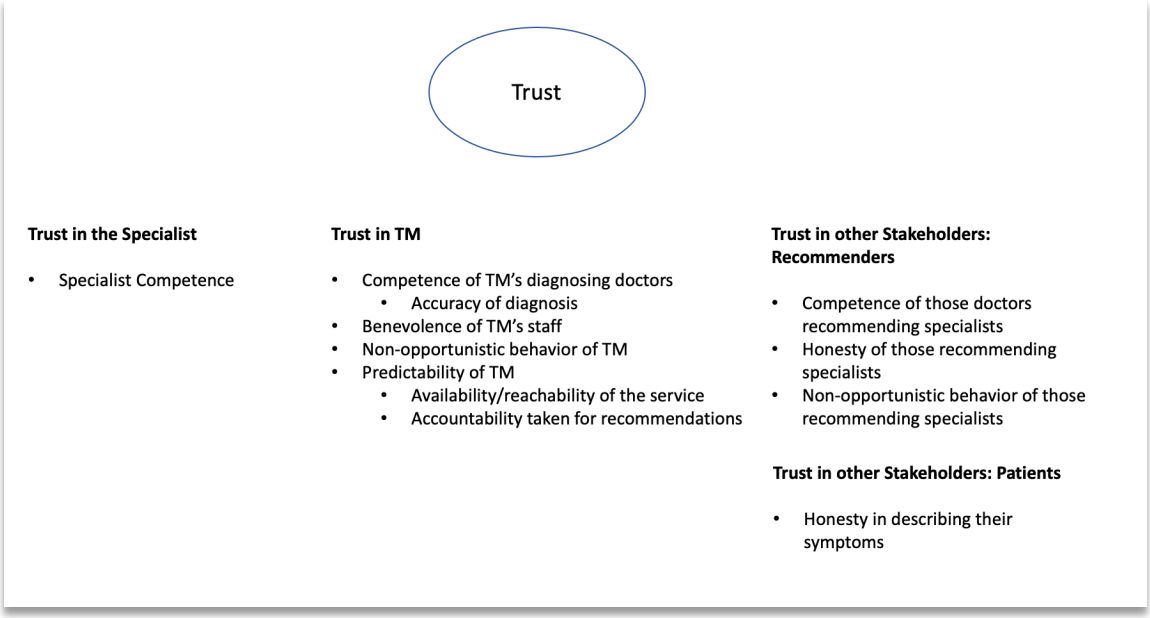


Figure 22: Result of the Conceptual Analysis and Refinement of the values "trust" for TM's operational context

The conceptual break down of each prioritized core value and its value qualities allows to translate these into EVQRs as outlined in table 8.

Equality based TM Strategy: EVQR Analysis					
Ref #	Core Value	Value Quality	EVQR Ref #	EVQR (Ethical System Level Value Quality Require	Examples for how TM could comly with the EVQR
1	Equality	Patient Inclusion	1.1	Avoid discrimination of any patient by binding TM's use to u	TM should avoid high service charges for ist support which are unaffordable to low income patients
1	Equality		1.2	Avoid denial of opportunity of TM service usage	People who are uninsured or have not credit card should still be able to use the TM service to use the service
1	Equality		1.3	Exclude patients only on reasonable and appropriate ground	If patients continuously misuse the TM service, i.e. for quick sickness-notifactions, their exlusion should be reasoned and appropriate
1	Equality		1.4	Avoid any systematic exclusion of individuals or groups from	There should be no groups systematically excluded by TM (i.e. people without private health insurace)
1	Equality	Specialist accessibility	1.5	Integrate only specialists who are willing to unconditionally	TM should avoid recommending specialists who charge exceptionally high prices for their services and only accept patients that are able to pay thoses
1	Equality		1.6	Develop programs for conditional access if specialist access	TM could develop programs like membership programmes or research-driven programmes that allows low income patients to access very expensive specialists
1	Equality	Lack of patient-doctor care/virtuality	1.7	Allow for care to unfold	TM should not limit the time that is required for TM staff to talk to patients
1	Equality		1.8	Avoid to process and display patient data that might lead to	TM should not display to TM doctors the insurance status of patients;such as whether the patient has private insurance or not
2	Privacy	Patient data security	2.1	Ensure the confidentiality of patient data	TM should encrypt all personally identifiable data transfered and stored; including that of patients, doctors, recommenders and on specialists
2	Privacy		2.2	Ensure the integrity of patient data	TM should ensure that the access rights to to any kind of personally identifiable data are well managed
2	Privacy		2.3	Ensure the availability of patient data	TM should have an available/accessible back-up copy of all its personally identifiably data
2	Privacy	Patient anonymity	2.4	Provide for the possibility of anonymous use of the TM servi	TM should give patients the option to consult the service and pay for it in an anonymous way
2	Privacy		2.5	Ensure technical anonymity for those who want anonymity	Delete all collected data of anonymous service users right after treatment
2	Privacy/Honesty	Information Control/ transparency	2.6	Give all parties whose personal information is processed on the TM platform information control over the use of their data through	TM should give meaningful, veridical, comprehensive and appropriate information to any patient, doctor or specialist on how it uses, processes, transfers and stores patient data and for what purposes
2	Privacy	Decision Control	2.7	processed the right to decide how their datat is used	TM should give any party whose personal data is processed the possibility easily rectify or delete their data
2	Privacy	Behavioral Control	2.8	processed the possibility to see or know about whehter their decisions in terms of data handling were respected by TM	TM should have an interface available that allows authorized individuals to access their personal data
2	Privacy/Accuracy	TM data quality	2.9	Ensure the accuracy of any personally identifiable data	TM should have routines to regularly check on the data quality
2	Privacy/Accuracy	TM data quality	2.10	Ensure the timeliness of any personally identifiable data	TM should have routines to regularly check on the data quality
2	Privacy/Accuracy	TM data quality	2.11	identifiable data	TM should have routines to regularly check on the data quality
2	Privacy/Knowledge	Accessibility of health information	2.12	patient data they need to offer the service in an efficient and high-quality way	TM should carefully modularize its data assets to assign data access authorization in such a way that TM staff sees what it needs to see
2	Privacy	Legitimacy of data use	2.13	Ensure that personally identifiable data is not used for purposes not agreed on with customers	TM should abstain from using personally identifiable data for any purpose outside of ist communicated service mission (for instance training an AI based on diagnosis data would need to be communicated to patients upfront)
3	Trust/Accuracy	Specialist quality/ competence	3.1	Ensure that the specialists recommended continue to live up to transparent quality requirements	Regularly visit specialists and check on their operations
3	Trust/Honesty	Lack of recomm sincerity	3.2	Foster honesty among recommending doctors	TM might be maximally transparent on who recommends who and for what reasons
3	Trust	Lack of recomm sincerity	3.3	Ensure that recommending doctors are competent themselves	TM could work with those specialists who have been recommended themselves
3	Trust	Lack of recomm sincerity	3.4	Ensure non-opportunistic behavior among recommending doctors	TM should think about an incentive scheme for recommending doctors that discourages them from recommending only "friends"
3	Trust	Patient insincerity	3.5	Ensure that patients are honest about their symptoms	Develop a communication scheme that helps TM doctors to always check for the sincerity of a patient's concern; this may be integrated into the pre-diagnosis tool
3	Trust/Accuracy	TM accuracy/ competence	3.6	Ensure that TM doctors are competent at diagnosing	Ensure regular training and schooling as well as knowlege exchange between TM doctors
3	Trust	TM accountability	3.7	Ensure that TM doctors do not act opportunistically	Potentially opportunistic behavior should be monitored; for example the willingness to quickly prescribe medication
3	Trust	TM accountability	3.8	Ensure that TM doctors do not act opportunistically	TM should not monitor or benchmark ist TM doctors in any way thereby inducing opportunistic behavior; such as treating many patients in the shortest possbile time etc.; TM could think of paying TM doctors partially for their success in recommending the right specialist
3	Trust	TM predictability/ availability	3.9	TM should always be available	TM should have a scheduling system and a number of staff that allows it to be always available with an approrpiate response time (waiting time for patients)

Table 8: Cor values are conceptually broken down, translated into EVQRs, and referenced with a number

TM now needs to determine how to handle this list of EVQRs. For this purpose it should be using the decision tree outlined in IEEE P7000 section 11.5.1. It turns out that TM must put great care to how it handles the privacy and security of all the personally identifiable data it collects, processes and stores. And this is not only true for the patient data it handles, but also for the data created during video-chat, data collected on specialists, data on recommending doctors etc. Against the background of the European Data Protection Regulation and in line with the recommendation of European's Data Protection Board, TM needs to run through a risk assessment as outlined in section 12 of IEEE P7000 or to turn to an alternative recognized privacy impact assessment standard. This recommendation is outlined in table 9 where the next recommended steps for TM are presented in line with IEEE P7000 section 11.5.1. It should be noted that EVQR Ref # 3.4 could become an issue for TM in the long run with a view to competition law. If TM reaches the kind of significant market share it plans for in this P7000 analysis then it must ensure that the platform does not unduly undermine competition.

Equality based TM Strategy: EVQR Analysis					
Ref #	Core Value	Value Quality	EVQR Ref #	EVQR (Ethical System Level Value Quality Requireme	Recommended further handling of EVQR
1	Equality	Patient Inclusion	1.1	Avoid discrimination of any patient by binding TM's use to undesriable outcomes	conduct threat & control assessment
1	Equality		1.2	Avoid denial of opportunity of TM service usage	conduct threat & control assessment
1	Equality		1.3	Exclude patients only on reasonable and appropriate grounds	conduct threat & control assessment
1	Equality		1.4	Avoid any systematic exclusion of individuals or groups from T	conduct threat & control assessment
1	Equality	Specialist accessibility	1.5	Integrate only specialists who are willing to unconditionally ac	schedule for organization
1	Equality		1.6	Develop programs for conditional access if specialist accessibi	schedule for organization
1	Equality	Lack of patient-doctor care/virtuality	1.7	Allow for care to unfold	conduct threat & control assessment
1	Equality		1.8	Avoid to process and display patient data that might lead to ur	conduct threat & control assessment
2	Privacy	Patient data security	2.1	Ensure the confidentiality of patient data	conduct detailed risk assessment
2	Privacy		2.2	Ensure the integrity of patient data	conduct detailed risk assessment
2	Privacy		2.3	Ensure the availability of patient data	conduct detailed risk assessment
2	Privacy	Patient anonymity	2.4	Provide for the possibility of anonymous use of the TM service	conduct threat & control assessment
2	Privacy		2.5	Ensure technical anonymity for those who want anonymity	conduct threat & control assessment
2	Privacy/Honesty	Information Control/ transparency	2.6	Give all parties whose personal information is processed on the TM platform information control over the use of their data through	conduct detailed risk assessment
2	Privacy	Decision Control	2.7	Give patients and any other party whose personal data is processed the right to decide how their datat is used	conduct detailed risk assessment
2	Privacy	Behavioral Control	2.8	processed the possibility to see or know about whehter their decisions in terms of data handling were respected by TM	conduct detailed risk assessment
2	Privacy/Accuracy	TM data quality	2.9	Ensure the accuracy of any personally identifiable data	conduct detailed risk assessment
2	Privacy/Accuracy	TM data quality	2.10	Ensure the timeliness of any personally identifiable data	conduct detailed risk assessment
2	Privacy/Accuracy	TM data quality	2.11	Ensure the completeness and consistency of any personally identifiable data	conduct detailed risk assessment
2	Privacy/Knowledge	Accessibility of health information	2.12	Ensure that TMs staff and specialists have access to the patient data they need to offer the service in an efficient and high-quality way	conduct detailed risk assessment
2	Privacy	Legitimacy of data use	2.13	Ensure that personally identifiable data is not used for purposes not agreed on with customers	conduct detailed risk assessment
3	Trust/Accuracy	Specialist quality/ competence	3.1	Ensure that the specialists recommended continue to live up to transparent quality requirements	conduct threat & control assessment
3	Trust/Honesty	Lack of recomm sincerity	3.2	Foster honesty among recommending doctors	conduct threat & control assessment
3	Trust	Lack of recomm sincerity	3.3	Ensure that recommending doctors are competent themselves	conduct threat & control assessment
3	Trust	Lack of recomm sincerity	3.4	Ensure non-opportunistic behavior among recommending doctors	conduct threat & control assessment
3	Trust	Patient insincerity	3.5	Ensure that patients are honest about their symptoms	conduct threat & control assessment
3	Trust/Accuracy	TM accuracy/ competence	3.6	Ensure that TM doctors are competent at diagnosing	schedule for organization
3	Trust	TM accountability	3.7	Ensure that TM doctors do not act opportunistically	conduct threat & control assessment
3	Trust	TM accountability	3.8	Ensure that TM doctors do not act opportunistically	conduct threat & control assessment
3	Trust	TM predictability/ availability	3.9	TM should always be available	schedule for organization

Table 9: EVQRs with recommended handling and specification of what core values and value qualities should undergo a risk assessment