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MULTISTAKEHOLDER ANALYSIS OF REQUIREMENTS TO DESIGN REAL INNOVATIONS

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ABSTRACT

People are generally influenced in their purchasing choices by diverse stake-holders and these influences are often not related to "use situations". Learning processes, product diffusion dynamics and externalities in fact frequently complicate innovation processes. "Design for Innovation" means considering that design cannot focus only on buyer's preferences and on "product use" because this could limit diffusion of products, besides bounding in general innovation opportunities. The "Design for Innovation" approach drives to study "beyond use situations" and the influences among the actors involved in the innovation processes. This paper describes the application of the "Design for Innovation" approach to MEDALLCARE, an Italian start-up company of the biomedical sector. What resulted is a more original list of needs that would have not emerged with more traditional approaches for the requirement management.

Keywords: requirement management, multi-stakeholder analysis, design for innovation

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1 INTRODUCTION

According to Innovation Management literature (see for instance, Schilling, 2008), innovating means designing something that will not only work from a technical point of view, but will also make business sense. Really, this increasingly means a more complicated process than simply making sure that a single buyer and a seller will find mutual benefit from a transaction, so that the former will buy a product from the latter. Often in fact the innovation process is complicated by learning processes, diffusion dynamics and externalities (Cantamessa et al., 2012). Hence, for instance, the actors who have not adopted products yet are usually influenced by the actors who have successfully done so, as well as buyers and users are not necessarily the same person and the actor(s) that will ultimately benefit from the product might be different from either the buyer or the user.

The logical consequence is that people are influenced in their purchasing choices by diverse stakeholders and therefore design by aiming only at buyer's preferences could limit the diffusion of products, besides bounding in general the innovation opportunities. The implication of this discussion is that, in order to have a successful innovation and therefore to actually make commercial impact, products or services have to be designed having in mind all the phases that constitute the innovation process and the specific decisions made by the actors in all the phases. Failing to do so can actually kill innovation even in the case of products with good potential. For instance, it may lead to designing products that might be used, but will never really be if they are not adopted first, or to products that will be bought, but then will not be properly used, and so on.

The concept of "Design for Innovation" is widely described in Cantamessa et al. (2012) and definitively that paper questions on traditional design approaches that mainly focus on the "user" though it is useful to consider "beyond use" situations. While many scholars debate about the importance to study the multi-faceted aspects of needs (Nicolas and Aurisicchio, 2011; Kim and Hwang, 2011), as well some attempts exist to define design specifications with multi-stakeholders lists of requirements (Shluzas et al., (2011)), there are still no models supporting a holistic representation of needs and their mutual relationships. Cantamessa et al. (2012) instead suggest that actors involved in the purchasing and use of products do not act in isolation from the others, driving to study the individual perspective of each actor besides the influences that are reciprocally cast among the needs of actors (also in term of conflicts) . If actors reciprocally influence to each other, they in fact can in turn be influenced in their needs and designers analyzing these influences can construct new needs and requirements that are the result of an "interpreted or expected impact" of these influences (Cascini et al., 2013).

Two consequences for designers result. The former is that designers must consider a wider set of needs as the basis for the requirement definition, that results in a "balanced expression" of stakeholder needs, the latter is that designers must investigate the way with which mutual influences among the actors impact on their needs. From now therefore needs, which would have not been considered if the influence had been missing, are taken into account, as well the importance of a need for an actor can increase or decrease because his experiential context.

Cantamessa et al. (2012) propose a method loosely inspired by MASAM (Multi-issue Actor Strategy Analysis Model, Bendahan et. al. 2004) for the analysis of inter-actorial influence on needs and by QFD as a basis for the definition of multi-actorial requirements. In this paper is described the application of this theoretical model to an Italian start-up company of the biomedical sector. This company really determined the optimal conditions for the application, since the influence of many actors in the purchase process of biomedical products is intrinsically quite evident and because this company was by nature (as it was a start-up) interested in product diffusion and had processes and procedures for requirement capture not assimilated yet. These conditions led the company immediately to realize the potentialities of the approach proposed.

The following Section 2 reviews the theoretical model of the "Design for Innovation" problem and details the method for tackling it. Section 3 describes the application for the biomedical product object of study while concludes with some reflections on the results.

2 THE METHODOLOGY TO DESIGN FOR INNOVATION

The model in Cantamessa et al. (2012) proposes as a good balance between simplicity and representativeness of the reality, three situations beyond "use" (i.e. purchasing, delivering benefits and

creating further impact or externalities) and namely includes four stakeholder roles (i.e. buyers, users, beneficiaries and outsiders).
Each of these stakeholders operates based on a set of specific needs. These needs can derive from the actor itself (native needs) or can result by influences cast among actors (reported needs). The influence cast by an actor on another actor can lead to a reported need if that need would not have been considered when the influence had been missing. Conversely, the importance or the perception that an actor assigns to a native need can be augmented or diminished by the influence.
Hence the influence can be exerted by actor i on i either through the modification of the importance attributed to native needs or through needs, originally not native, that after the influence become issues also for the actor i'. Or better, native needs can be completely different (as shown in figure 1a) or can be common to more actors (as shown in figure 1b). Not common needs can be shared after the influence, common needs instead are related one to each other, and consequently the influence can result in an increased or decreased importance associated by the actor i on his own native issue j. This means, for instance, that a direct intended influence of the actor i on the actor i’ can have as result that a native need of i becomes reported for i’ as well as that if there exists a coincidence between the goals of actors i and i’, satisfying the need of the actor i’ is helpful to the satisfaction of the need of the actor i and the need importance increases.

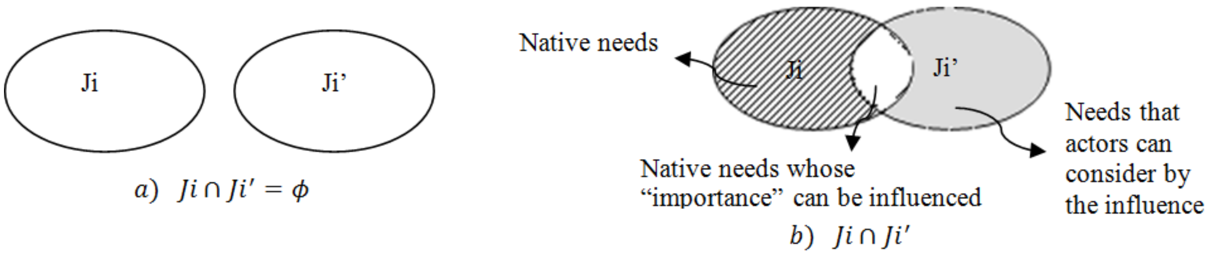


Figure 1: Set of influence on Needs

From now on, defined as J the set of issues (i.e. needs), J_i represents the set of the needs j typical of actor i (i.e. the native needs) and $\bar{J_i}$ the complementary set of needs j of actor i that are not native, but that could be reported:

$$J_i \subset J \quad J_i = native \tag{1}$$
$$\bar{J_i} \subset J \quad \bar{J_i} = reported \tag{2}$$

the importance an actor i attributes to need j, *Importance*$_{i,j}$,can be expressed by (3) if J_i and J_i’ are separated:

$$imp_{i,j} = \begin{cases} pos_{i,j} * sal_{i,j} & \forall j \in J_i \\ \sum_{i' \neq i;\, \forall j \in J_{i'}} pos_{i',j} * sal_{i',j} * influence_{i',i} & \forall i' \neq i;\ \forall j \in J_{i'} \end{cases} \tag{3}$$

while can be considered expressed by (4) if the intersection between the two set of needs, J_i and J_i’ is not empty:

$$imp_{i,j} = \begin{cases} pos_{i,j} * sal_{i,j} & \forall j \in J_i - (J_i \cap J_{i'})\ \forall i' \neq i \\ \sum_{i' \neq i;\, \forall j \in J_{i'} - (J_i \cap J_{i'})} pos_{i',j} * sal_{i',j} * influence_{i',i} & i' \neq i;\ \forall j \in J_{i'} - (J_i \cap J_{i'} \\ pos_{i,j} * sal_{i,j} + \sum_{i' \neq i;\, \forall j \in Ji \cap Ji'} pos_{i',j} * sal_{i',j} * influence_{i',i} & i' \neq i;\ \forall j \in (J_i \cap J_{i'}) \end{cases} \tag{4}$$

having defined the *Position* $_{i,j}$ of the relevant actor i on the need j (i.e. the direction towards which an actor is willing to exert influence over an issue) and the *Salience* $_{i,j}$ of actor i on need j (i.e. the priorities of a need for the actor and the loss of utility when the design outcome is different from one's need) as:

$$position_{i,j} = pos_{i,j} \subset [-1;1] \quad (5)$$
$$salience_{i,j} = sal_{i,j} \subset [0;1] \quad (6)$$

Equations (3) and (4) do not consider indirect influences among actors; if the intent is to consider also them (as it happens for instance in the presented case study) the $Importance_{i,j}$ should be expressed by equations like (7), where for instance the actor i is influenced by actors i' and i'' and actor i' is influenced in his turn by i'':

$$imp_{ij} = Pos_{ij} * Sal_{ij} + \Delta 1 * [(Pos_{i'j} * Sal_{i'j} + \Delta 2 * Pos_{i''j} * Sal_{i''j} * Inf_{i''i'j}) * Inf_{i'ij} + Pos_{i''j} * Sal_{i''j} * Inf_{i''ij}$$
(7)

being Δ1 and Δ2 factors for normalization.
When influences are calculated, native and reported needs distinguished by the actors they are related to can be shown in a table as in Figure 2.

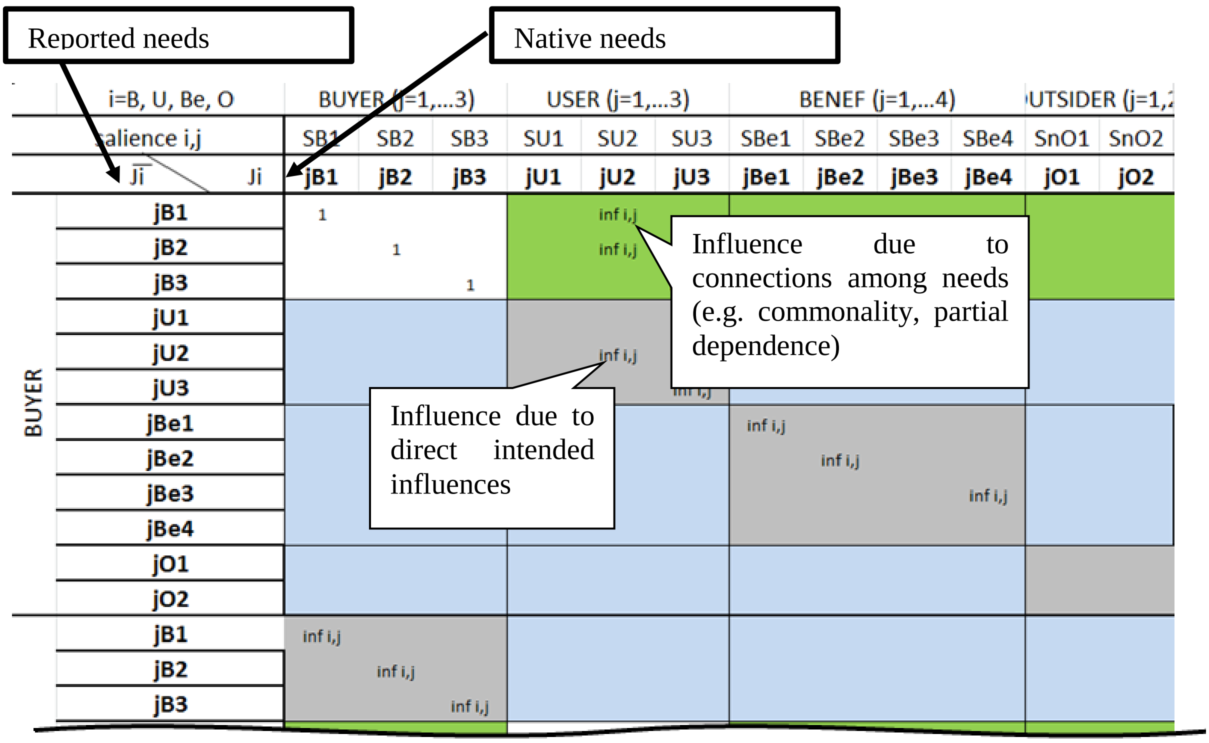


Figure 2: Influence analysis of Needs

The first row and the first column list the native and the reported needs respectively, clustered by actors according to the classification of the roles depicted in the model (i.e. buyers, users, beneficiaries and outsiders). Native needs are also associated to the salience the actor gives to the need. Each distinct matrix cell represents the single contribution, in term of influence, by which an actor passes from his initial set of native needs to his final set of reported ones.

- green cells represent the influence due to connections among needs (e.g. commonality, dependence, etc.). For instance, if the need j of the user U1 coincides with the need j of the buyer B1, the influence there will be 1. This need is common to both the actors.

- grey cells are related to direct intended influences between two actors (i.e. not native needs, that after the influence become considered issues); For instance, if the need j of the user U1 becomes needs for the buyer B1, the influence there will be not zero.
- white cells constitute the self-influence of an actor on himself, thus assuming the value 1.

Reading the table by rows we obtain the $Importance_{i,j}$ of each need and determine grouping columns what can be named *aggregation by importance*. Aggregating by importance, therefore per actor involved (e.g. the buyer) is calculated a vector of native (e.g. JB1, JB2, JB3) and reported needs (e.g. JU1 or JBe2, etc.) whose $Importance_{i,j}$ is mediated by the diverse influences in the row. These values mirror that the importance attributed by the actors on needs can rise or diminish after that reciprocal interactions perform their effects in term of influence. If a need is judged important by two actors the importance of the need will be enhanced, while if two actors disagree in their judgements the importance will result as mediated by the power of influence of each actor.
This list of needs (i.e. native plus reported) for each actor however is not the final goal of the analysis since the output at the end should be managing a single need list to feed a sort of QFD procedure. Moreover, looking at the whole list of needs often it contains needs that are repeated more than once. The *aggregation by actor* is consequently the next even though thornier step of the analysis. The approaches to aggregate by actor are two: either, each list can be fed into corresponding actor-specific QFD matrices or merge the diverse lists in a unique one that will be fed into a single QFD matrix. The former choice preserves the diverse actor's perspectives but it will be difficult to manage when requirements should be aggregated; the latter make you to create a unique list of needs since the beginning (thing that is easier because needs can be directly verified with customers) but it could be misleading if one simply average out needs into the QFD matrix without being aware of the consequences.
It is likely in fact that conflicts will emerge, since actors might have contradictory needs (*e.g., cost for the buyer and ease of use for the user*). If all the stakeholders were together when designers define requirements it would be possible negotiate between the diverse stakeholders' positions and find a compromise (e.g. *make a product that "costs a bit less but is a bit harder to use"* being careful in driving towards a result such as no sales and no usage at all). When instead, as often happens, stakeholders act not contextually in the decisional process, the negotiation is impossible. In these cases, stakeholders could assume veto positions on decisions and hence one can either work at organizational level by appealing to third parts that one knows gain leverage in the negotiate or formalize the conflict and try to solve contradictions between the needs themselves. It is just acting either as a logical OR among actors' needs or as a logical AND. In the example made, this could drive in the former case to solutions dominated on the whole but anyway effective (e.g. make a product that *"costs a less"* OR that "*is a easier to use"*), while in the latter it could lead to significant changes in the product ("*we really must find a solution so that the product is cheaper AND easier to use*") or in the go-to-market strategies ("*how can we make the product easy to use AND make the buyer aware of the benefits*?", or "*how can we make the product cheap AND direct some of the benefits on the user so that he will not be against it*"?).
Once the requirement list is obtained, the passage to QFD matrix is quite traditional and hence we do not run upon it in this paper. The complete procedure is described by the IDEF diagram drawn below in figure 3:

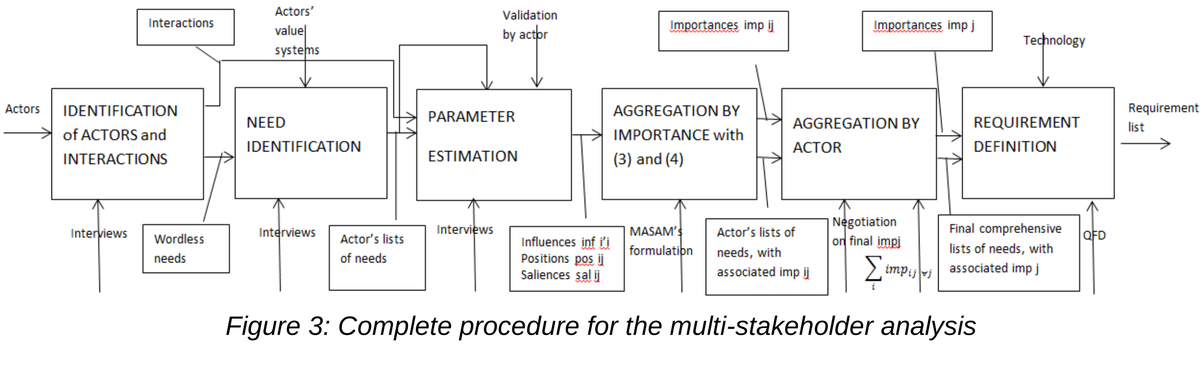


Figure 3: Complete procedure for the multi-stakeholder analysis

3 A CASE FROM MEDICAL-CARE INDUSTRY

The multi-stakeholder model was tested in MEDALLCARE, an Italian start-up company that was supported in the requirement capture phase for their line of products CHITOSMART. This line proposes innovative products that could replace the existing bandages, gauzes and dressings to cure several pathologies (domestic or hospital ones).

Being a start-up company in the biomedical industry determined the best possible conditions to acquire this new methodological tool for diverse reasons. First, as a start-up this company, more than others, needed to be innovative and to make its products diffused. Then, in this company organizational procedures and processes were not permanent yet and therefore tools that in older companies would have been used in a more traditional way as definitely assimilated, there could be acquired ex novo. Moreover, biomedical products need more than other products of good business practices besides specialist technological knowledge in order to be market-attractive. Finally, the influence of many actors in the purchasing processes is intrinsically quite evident and the company immediately realized the potentialities of the approach proposed.

Purchasing and usage of biomedical technologies, such as CHITOSMART products, could in fact affect or be affected by several involved actors. A biomedical product is usually applied to a patient by a nurse, which received medical instructions by a doctor. A patient is surely the proper beneficiary of such a product, whose efficacy directly interests his parents, which could in turn influences the product usage in hospital but, in particular, the purchasing process in chemist's. Moreover, referring to a hospital, in general, the capillary usage of a biomedical product is strongly determined by decisions of corporate governance as well as in its turn purchasing department definitively determines at the end if a specific product must be purchased or not. Thus, it clearly appeared how a multi-stakeholder analysis can be appropriate to properly evaluate the mutual influences of such stakeholders during the purchase/usage process of a biomedical product.

Hence, five actors were defined (i.e. Purchasing department, Ward management, Doctor; Nurse, Patient) and for each of them a list of primary needs was identified. Besides them several reported need were studied through the influence analysis. Figure 4 shows a portion of the bigger table that contains all the influences for each single actor's need.

Actors	Salience i,j	NURSE										MANAGEMENT		PATIENT				
	(Ji)' \ Ji	Simplify further analysis	Fast application	Easy to apply and remove	Allow to use wrong dimensions	Adapt to different body parts	Correct positioning and hold the primary dressing	Good resistence if soaked	Pain relief	Prevent losses and bleedings	Ensure long effectiveness	Reduce length of hospital stay	Reduce human resources	Reduce lenght of hospital stay	Fast application	Easy to apply and remove	Feels comfortable	Pain releif
DOCTOR	Effectiveness of treatment																	
	Breathable																	
	Reduce healing time											0,74		0,74				
	Reduce human resources												0,74					
	Reduce infection risk																	
	Simplify further analysis	0,71																
	Correct positioning and hold the primary dressing						0,71											
	Good resistence if soaked							0,71										
	Feels comfortable																0,74	
	Pain relief																	0,74
	Prevent losses and bleeding									0,71								
	Fast application		0,71															
	Easy to apply and remove			0,71														
	Adapt to different body parts					0,71												
	Ensure long effectiveness										0,71							
	Fast application														0,74			
	Easy to apply and remove															0,74		

Figure 4: Influence analysis of Needs for CHITOSMART products

On the left side of the table it is possible to see each actor with his list of needs, to which an importance was assigned. The diverse lists contain needs that are native or reported and this leads to having some needs in the list that are common to diverse actors as native, while others result common because reported. For each of needs, the importance is aggregated by [7] as mediated by the diverse influences of the other involved actors. Figure 4 shows definitively, and more evidently, the outputs of this *aggregation by importance*. Focusing on the part of the table that shows the doctor's needs, one can distinguish native needs from the reported ones. It is possible to identify indeed native needs not shared with others actors (such as effectiveness of treatment) which have pos_{ij} and sal_{ij} defined, but have not imp_{ij} derived by the other actors. Then there are native needs shared and influenced by other actors (such as reduce healing time) which have own pos_{ij} and sal_{ij} as well as the imp_{ij} consequent by

the influences of the other actors. In this case instead needs not native and fully reported are completely missing.
The *aggregation by actor* was the further and spiny step of the analysis. Create a list to be fed into corresponding actor-specific QFD matrices generally preserves the diverse actor's perspectives even though normally generates at the end difficulties in the requirement aggregation. In this case study, in addition, customers perspectives were not so exhaustively explored as the company was in a start-up condition; customer were more exactly imagined on occasion as neither the complete market possibilities could be well-defined a priori. A so precise approach therefore would have been too accurate in respect to the real benefits achievable.
Therefore for CHITOSMART products the second possible method of merging the diverse lists in a unique one was followed. Stakeholders were not all together when designers were defining requirements and hence the negotiation was impossible. What was made in order to shy away from simply average out all the needs was intervening at organizational level. Third parts that could gain leverage in negotiation were involved so as to blunt veto positions and conflicts were formalized in order to solve the contradictions emerged. This allowed obtaining a final list of needs shared among the stakeholders and Figure 5 shows the table definitively accepted. Among these needs diverse elements were identified, some more obvious because they would have anyway emerged also with more traditional approaches and other more original as not strictly related to product structures. Short air exposure of the injured body areas resulting in low risks of infection, positioning practicality, easiness in the use, rapidity of the medical treatment, the elastic-compressive action to obtain good clinical results from the esthetical and functional point of view were rather obvious to imagine but others instead were less explicit at the beginning. The bodily pre-conformation of the components, the modulation in compression to hinder not only potential bleedings but also the blood-serum storage over the wound, the possibility of pharmacological preparations and medicaments in situ resulted in fact just because the diverse actor perspectives were considered and the conflicts solved. Adherence to body portions for instance is important to maintain the medication steady, but it can compromise breathability if compression is not moderated. The pre-conformation of the components was proposed by a nurse interviewed, modulation in the compression by a doctor; these two needs together solved the contradiction.
At the same time, the treatment of a higher number of patients with a lower requirement for medical personnel and strong time reductions of stay in hospitals, all leading to a decrease of clinical costs could have been considered simply fortuitous consequences if they was not considered already in the design phases among the needs to meet.
Figure 6 shows the derived house of quality for the QFD procedure.

4 CONCLUSIONS

The present paper aims at contributing to the growing scientific debate about needs identification and requirements specification. The papers evaluates impact of multi-actorial contexts and influence elements on Need identification and Requirement Definition. In particular it considers the explicit representation of influences on people needs by stakeholders, meant as all the actors who are involved in the product life from the purchasing phase to each stage of use and disposal. Ignoring this impact can actually limit design solutions and destroy the innovation opportunities, being it related to adoption and diffusion processes of a product as well as a service, from mass production to made-to-order businesses.
The paper describes the application of the theoretical model proposed in Cantamessa et al. (2012) for the analysis of inter-actorial influence on needs and for the definition of multi-actorial requirements. This application was led in MEDALLCARE, an Italian start-up company of the biomedical sector that, likely for particular circumstances (in term of product typology and company conditions), immediately realized the potentialities of the proposed approach.
Results obtained not only validate the methodology proposed but also demonstrate the effectiveness of the approaches that integrate tools from diverse fields (such as the ones described in Montagna, 2011) besides representing a contribution from a practical point of view. Designers through this method consider as the basis for the requirement definition a wider set of needs than by traditional approaches. The quantitative model proposed in addition leads to negotiate compromise solutions, as well as to highlight conflicts between actors' needs to be leveraged as a hint to guide the generation of solutions.

PURCHASING DEPARTMENT

ID	NEED j	Pos ij	Sal ij	INFLUENCE							IMP TOT NORM
				Who?	closeness	autority	Influence ii'	Pos i'j	Sal i'j	Pos*Sal	
1	cheapness	1	1,00	NATIVE						100%	50%

MANAGEMENT

ID	NEED j	Pos ij	Sal ij	INFLUENCE							IMP TOT NORM
				Who?	closeness	autority	Influence ii'	Pos i'j	Sal i'j	Pos*Sal	
2	reduce length of hospital stay	1	0,80	NATIVE						80%	59%
				Doctor	0,5	0,7	0,62	1	0,6	60%	
3	reduce human resources	1	0,75	NATIVE						75%	58%
				Doctor	0,5	0,7	62%	1	0,65	65%	

DOCTOR

ID	NEED j	Pos ij	Sal ij	INFLUENCE							IMP TOT NORM
				Who?	closeness	autority	Influence ii'	Pos i'j	Sal i'j	Pos*Sal	
4	reduce healing time (reduce length of hospital stay)	1	0,80	NATIVE						80%	100%
				Management	0,5	0,9	74%	1	0,8	80%	
				Patient	0,5	0,9	74%	1	0,8	80%	
3	reduce human resources	1	0,60	NATIVE						60%	58%
				Management	0,5	0,9	0,74	1	0,75	75%	
5	effectiveness of treatment	1	1,00	NATIVE						100%	50%
6	prevent losses and bleeding	1	0,80	NATIVE						80%	91%
				Nurse	0,8	0,65	71%	1	0,8	80%	
				Patient	0,5	0,9	74%	1	0,6	60%	
7	reduce infection risk	1	0,90	NATIVE						90%	70%
				Nurse	0,8	0,65	71%	1	0,7	80%	
8	simplify further analysis	1	0,60	NATIVE						60%	59%
				Nurse	0,8	0,65	71%	1	0,8	80%	
9	feels comfortable (not annoying)	1	0,70	NATIVE						0,7	98%
				Nurse	0,8	0,65	71%	1	0,7	70%	
				Patient	0,5	0,9	74%	1	1	100%	
10	pain relief	1	0,75	NATIVE						75%	75%
				Patient	0,5	0,9	74%	1	1	100%	
11	correct positioning and hold the medication	1	1,00	NATIVE						100%	86%
				Nurse	0,8	0,65	71%	1	1	100%	
12	breathable	1	1,00	NATIVE						100%	83%
				Nurse	0,8	0,65	71%	1	0,9	90%	
13	good resistence if soaked	1	0,60	NATIVE						60%	78%
				Nurse	0,8	0,65	71%	1	0,7	70%	
				Patient	0,5	0,9	74%	1	0,6	60%	
14	easy to apply and remove	1		Nurse	0,8	0,65	71%	1	1	100%	60%
				Patient	0,5	0,9	74%	1	0,65	65%	
15	fast application	1		Nurse	0,8	0,65	71%	1	1	100%	58%
				Patient	0,5	0,9	74%	1	0,6	60%	
16	ensure long effectiveness	1		Nurse	0,8	0,65	0,71	1	0,65	65%	23%
17	encourage good cicatrization	1		Patient	0,5	0,9	0,74	1	1	100%	37%
18	adapt to different body parts	1		Nurse	0,8	0,65	0,71	1	0,9	90%	32%

NURSE

ID	NEED j	Pos ij	Sal ij	INFLUENCE							IMP TOT NORM
				Who?	closeness	autority	Influence ii'	Pos i'j	Sal i'j	Pos*Sal	
6	prevent losses and bleeding	1	0,80	NATIVE						80%	95%
				Doctor	0,8	0,8	80%	1	0,8	80%	
				Patient	0,9	0,65	75%	1	0,6	30%	
7	reduce infection risk	1	0,70	NATIVE						70%	72%
				Doctor	0,8	0,8	0,8	1	0,9	90%	
4	reduce healing time	1	0,50	NATIVE						50%	49%
				Doctor	0,8	0,8	0,8	1	0,6	60%	
8	simplify further analysis	1	0,80	NATIVE						80%	65%
				Doctor	0,8	0,8	0,8	1	0,6	60%	
14	easy to apply and remove	1	1,00	NATIVE						100%	75%
				Patient	0,9	0,65	0,75	1	0,65	65%	
15	fast application	1	1,00	NATIVE						100%	73%
				Patient	0,9	0,65	0,75	1	0,6	60%	
16	ensure long effectiveness	1	0,65	NATIVE						65%	33%
9	feels comfortable (not annoying)	1	0,70	NATIVE						70%	73%
				Patient	0,9	0,65	75%	1	1	100%	
19	allow to use wrong dimensions	1	0,40	NATIVE						40%	20%
10	pain relief	1	0,70	NATIVE						70%	73%
				Patient	0,9	0,65	75%	1	1	100%	
11	correct positioning and holding the medication	1	1,00	NATIVE						100%	91%
				Doctor	0,8	0,8	80%	1	1	100%	
13	good resistence if soaked	1	0,70	NATIVE						70%	35%
12	breathable	1	0,90	NATIVE						90%	86%
				Doctor	0,8	0,8	80%	1	1	100%	
18	adaptable to different body parts	1	0,90	NATIVE						90%	45%
5	effectiveness of treatment	1	0,60	NATIVE						60%	71%
				Doctor	0,8	0,8	80%	1	1	100%	
17	encourage good cicatrization			Patient	0,9	0,65	75%	1	1	100%	38%

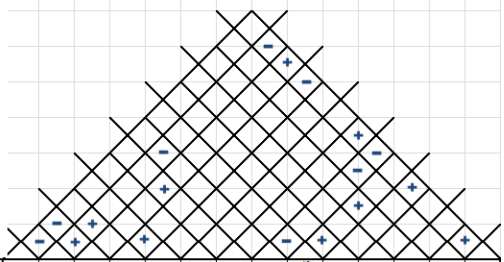
PATIENT

ID	NEED j	Pos ij	Sal ij	INFLUENCE							IMP TOT NORM
				Who?	closeness	autority	Influence ii'	Pos i'j	Sal i'j	Pos*Sal	
2	reduce length of hospital stay	1	0,80	NATIVE						80%	40%
6	prevent losses and bleeding	1	0,60	NATIVE						60%	30%
14	easy to apply and remove	1	0,65	NATIVE						65%	74%
				Nurse	0,9	0,75	0,81	1	1	100%	
15	fast application	1	0,60	NATIVE						60%	71%
				Nurse	0,9	0,75	0,81	1	1	100%	
9	feels comfortable (not annoying)	1	1,00	NATIVE						100%	50%
17	encourage good cicatrization	1	1,00	NATIVE						100%	50%
10	pain relief	1	1,00	NATIVE						100%	50%
13	good resistence if soaked	1	0,60	NATIVE						60%	30%

Figure 5: Matrix of importance

ID	NEED	BUYER	MANAG	DOCTOR	NURSE	PATIENT	NORM SUM
1	Cheapness	50%					23%
2	reduce length of hospital stay		59%			40%	45%
3	reduce human resources		58%	58%			52%
4	reduce healing time			100%	49%		67%
5	Effectiveness of treatment			50%	71%		55%
6	Prevent losses and bleeding			91%	95%	30%	98%
7	reduce infection risk			70%	72%		64%
8	simplify further analysis			59%	65%		56%
9	feels comfortable (not annoying)			98%	73%	50%	100%
10	pain relief			75%	73%	50%	90%
11	correct positioning and hold the medication			86%	91%		80%
12	Breathable			83%	86%		76%
13	good resistence if soaked			78%	35%	60%	78%
14	easy to apply and remove			60%	75%	74%	95%
15	fast application			58%	63%	71%	87%
16	ensure long effectiveness			23%	33%		25%
17	encourage good cicatrization			37%	38%	50%	57%
18	adapt to different body parts			37%	45%		37%
19	allow to use wrong dimensions				20%		9%

Figure 6: Weighted list of needs



	Needs\Requirement	Importance	non adhesive and soft	stretch	compressive	open and enveloping	interconnection velcro	traction resistent	variability of sizes and dimensions	water vapor permeable	impermeable to biological fluids	internal medication	radiolucent and nonmagnetic	hypoallergenic and inert	temperature homeostasis	anatomically structured
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Cheapness	23%		●					○	●	●					◊
2	reduce length of hospital stay	45%				◊	○			●	●	○		●		
3	reduce human resources	52%			●	◊							○			◊
4	reduce healing time	67%	●		●	○	○			●	●	○		●	○	○
5	effectiveness of treatment	55%	●	●	●	◊	◊	●	◊	●	●	○		●	●	◊
6	prevent losses and bleeding	98%		○	○		○	◊			●					◊
7	reduce infection risk	64%				○				○	●	○		●	○	◊
8	simplify further analysis	56%					○		◊				●			○
9	feels comfortable (not annoying)	100%	●		○	●	○		○	○	●	◊		●	◊	●
10	pain relief	90%	●			○			◊			●				○
11	correct positioning and hold the primary dressing	80%		●	○	○	●	●	●							●
12	breathalble	76%	○			◊				●						◊
13	good resistence if soaked	78%		○	○			◊		◊	●					
14	easy to apply and remove	95%	●	●		●	●	◊	○			◊				○
15	fast application	87%	●	○		●	●		○			○				●
16	ensure long effectiveness	25%						●		○	○	●	◊		○	
17	encourage good cicatrization	57%	◊	●	●					◊	◊	●		◊	◊	◊
18	adapt to different body parts	37%		●	◊	◊	◊	●	●							●
19	allow to use wrong dimensions	9%		●		◊										○
	Requirements importance		47,2	41,6	31,9	37,1	35,4	20,5	21,7	31,0	49,0	26,9	6,9	30,4	11,2	41,1
	Requirements importance Normalized		96,4	84,8	65	75,7	72,3	41,7	44,2	63,2	100	54,9	14	62	22,9	83,9
	Ranking Requirements		3	2	6	8	9	11	12	5	1	10	14	7	13	4

Figure 7: House of quality

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