Task uncertainty and rationality in medical problem solving

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Abstract

Quality issue. Medical problem-solving situations are characterized by various degrees of ‘task uncertainty’—i.e. uncertainty related to the definition of a problem, the effect of a technology, the value of a solution, and so on. The need for professional discretion varies and depends on the degree of perceived task uncertainty.

Suggested solution. In this report it is argued that, in order to obtain rationality in problem-solving processes, differences in the degree of task uncertainty need to be met by variation in the structure of the health care organization.

Implications. The main implications of this view are that (under norms of rationality) problem-solving processes with low task uncertainty must be organized in one way and processes with high task uncertainty in another. Furthermore, processes with high and low task uncertainty also need to be evaluated according to different standards. Some hypotheses regarding the different organizational requirements are presented.

Keywords: clinical pathways, effectiveness, evidence-based medicine, organizational performance, problem solving, quality of care.

Although there may be some similarities between professional services provided within health care and the more general service organizations, these must not be overemphasized [1]. In general, each kind of organization has its own unique properties and must be studied and understood on its own terms [2]. Therefore, the popular ideas advocated in the so-called new public management [3] may have to be carefully evaluated before they are introduced into the health care organization. The ideas from new public management are noticeable, e.g. in an international study by Arah et al. [4] of conceptual bases for monitoring and stimulating health care performance. Likewise, in a recent article, Berg et al. [5] advocate a streamlining of health care processes in line with the view that health care is a commodity that can be produced in a similar way to any industrial product.

The purpose of this report is to show that, although streamlining of health care performance may be desirable in some cases, it may be devastating in others—it all depends on the task at hand. In general terms, the main task of the health care organization is to provide problem solving for individual patients. In this problem-solving process, a choice has to be made about what problems to attend to and what courses of action to take, and some degree of uncertainty is generally attached to all such choices [6,7]. However, there are variations in the degree of uncertainty. In some cases, the task uncertainty is fairly low and mainly related to the flow of the production process, e.g. when the problem is very obvious. In other cases, the task uncertainty is high and may be related to lack of knowledge about the actual problem situation, e.g. when the problem is diffuse and the facts are contradictory.

This variation in the degree of task uncertainty in actual practice has largely been disregarded or defined away in studies of evidence-based medicine (EBM). Actually, EBM has been accused of obscuring the uncertainty inherent in patient care [8]. Consequently, uncertainty and variation has scarcely been taken into consideration in the construction of EBM guidelines or so-called clinical pathways [9]. A study by Panella et al. [10] demonstrated that some of the pathways could not be followed because of the variances in the medical cases. Other studies dealing with the implementation of clinical pathways have demonstrated that among physicians’ reasons for not adhering to the pathways is the view that the quality of evidence is insufficient, partly because it is generally based on a small number of cases and partly because some cases are excluded to reduce variation [9,11]. Furthermore, several studies on the implementation of EBM have noted that guidelines or clinical pathways need to be constructed with a view to the context in general, and to the more specific organizational structure and values of the organization [11–14].

During an ordinary workday, a physician encounters a variety of cases with random variation in the degree of task uncertainty. However, the handling of these cases is performed within a uniform organizational structure. Depending on the degree of task uncertainty, the structure will, to a varying degree, hamper and obstruct some of the problem-solving processes.

To cope with the variation in task uncertainty in the uniform structure, the task can be made to appear less uncertain

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through increased routinization. An alternative is to increase the capacity to handle uncertainty through hoarding of excess resources. Although routinization and hoarding may be rational means to bring about production, they may simultaneously hamper rationality in relation to the outcome. One example is that routinization may assure high throughput of cases with low task uncertainty. However, for cases with high task uncertainty, the same amount of routinization might, instead, result in the expedient handling of constantly reappearing patients. Another example is that, in cases with high task uncertainty, hoarding may be an efficient way to acquire necessary slack resources for a thorough problem search. However, in cases with low task uncertainty, the possibilities of production planning may be overlooked when excess resources make it possible to avoid planning by ‘storing’ the patients in beds.

The conclusion of this report is that, in order to increase rationality in problem-solving processes, differences in task uncertainty need to be handled in different structural settings. The following report will first explain the various notions involved and then go on to suggest some hypotheses regarding the general requirements of structural differences.

Task uncertainty, rationality, and structure

Task uncertainty

Task uncertainty can be described as the difference between the information required to perform a specific task and the amount of information possessed by the decision maker [15]. In a problem-solving process, a choice is made about what problems to attend to and what action to take—and uncertainty is attached to most choices. One type of uncertainty concerns the situation itself—raising the question of whether it presents a problem at all, and if so, how to define the problem. Another type of uncertainty relates to the course of action required and the various possible outcomes. A third type of uncertainty concerns the value of the possible actions or outcomes [16]. The perceived uncertainty diminishes as more knowledge is acquired. However, what is regarded as knowledge is not always very systematic [17]. It is often just a widely accepted theory, or a qualified guess—and even faint rumours, wishful thinking, and superstitious ideas may pass as knowledge. Therefore, a more general definition of task uncertainty is lack of reliable (e.g. evidence-based) knowledge [18,19].

Purpose and value rationality

The core of rationality may be described as means–end logic. Weber [20] makes a basic distinction between purpose and value rationality. Purpose rationality means that activities are perceived as rational when they, by logical reasoning, may be related to the fulfillment of a preset goal. The notion of efficiency is mainly used as a measure of purpose rationality and may be described as the achievement of a certain goal by economizing on the resources. Value rationality refers to the situation when the reasoning involved in setting a goal is related to values of e.g. ethical, political, or religious origin. The notion of effectiveness is used as a measure of value rationality and concerns, e.g. what goals to pursue, the ethical question of priorities, and how completely a problem is solved [21].

Decision rationality versus action rationality

The main issue in a problem-solving process is to choose what to do—and to get it done. Corresponding to these two problems, there are two kinds of purpose rationality: decision rationality and action rationality [16,18]. Decisions and actions follow different logics, and they are difficult to pursue simultaneously because what seems rational from an action perspective seems irrational from a decision perspective and vice versa. Actions are based on expectations, motivation, and commitment. If a decision is made to initiate action, it must incorporate all these elements. Therefore, limited rationality in the search for alternatives and in their evaluation makes sense from an action perspective because the consideration of multiple alternatives normally evokes uncertainty, and this reduces motivation and commitment. For instance, if several alternatives are suggested, they may all have some merits worthy of consideration. If the pros and cons of the alternatives are explored further, this may result in uncertainty about the merits of any proposed action and that tends to dilute their perceived merits. So, although careful consideration of the options may increase decision rationality, it may hamper action rationality. Neither kind of rationality is superior to the other—but decision rationality and action rationality serve different purposes. The main point here is that a balance must exist between decision and action rationality and that balance will have to vary according to the degree of task uncertainty.

Structure

A basic idea in organization theory is that the structure of an organization should be compatible with its technology [19]. Therefore, purpose rationality is thought to decrease if there is an imbalance or poor fit between the structure and the conditions suitable for the performance of the core task. Structural features are regarded as those parts of the behaviour pattern that are fairly static or change slowly, and they emanate mainly from the principles regarding the grouping of activities and their subsequent integration. Other structural features include the degree of formalization of activities and the principles for evaluation of performance. In a complex organization, task uncertainty may be affected by the way the work is organized. An example of this is increased task uncertainty related to the complex web of interdependencies between physicians and patients and between individual physicians in the health care organization [22].

In the health care organization, a major obstacle to purpose rationality is the need to compensate for deficiencies, such as imbalance or poor fit between the structure and the main task [16,23]. One such compensatory process involves increasing the perceived knowledge by routinization. Here, knowledge can
be defined to include both what is real and what is believed—i.e. it may include things we might consider equivalent to knowledge, such as dogma, superstition, and prejudice. Whatever the origin of the knowledge, in an organization, it may be institutionalized into routines because such routinization diminishes task uncertainty and therefore enhances action rationality. A way to further enhance action rationality is to simplify or broaden existing routines, e.g. through redefining the outcome of a routine so that it will be valid for some statistically defined population instead of being related to the actual outcome for a certain individual [18]. Another way to handle uncertainty is to increase the capacity to handle it. This may be done primarily through *boarding*—i.e. through the acquisition of excess resources (*slack*). Such slack resources give room for enhanced discretion and make it possible to elaborate on decisions, e.g. through increased individual search processes. Therefore, within the prevailing structure, slack resources also increase decision rationality.

**Assumptions about structural requirements**

The basic assumption is that differences in task uncertainty place different demands on problem-solving processes. Differences in the structure are necessary to meet these demands. In the following, some hypotheses regarding these differences are suggested. The main structural features considered are differentiation, integration, formalization of activities, and the general values and norms related to the main task, including principles for evaluation of performance.

**Differentiation through grouping of activities**

In the health care organization, some problem-solving processes may be handled entirely by one specialized individual (simple technology). In other processes, several subspecialized individuals with different technological expertise may be involved (i.e. complex technology). This differentiation of the complex technology is generally the basis for the differentiation of the organization into different groups and, as a consequence, the extent of lateral relations is increased. A high degree of lateral relations increases complexity in problem-solving processes, which diminishes action rationality. On the contrary, this way of grouping activities enhances the ability to form temporary lateral relations, which increases decision rationality. Therefore, it seems that the greater the task uncertainty, the greater the probable mutual dependence between activities and, consequently, the greater the need for multi-contained temporary grouping. In cases with low task uncertainty, stable self-contained groups or sequential flow planning would seem appropriate. An example of low task uncertainty is the handling of e.g. tonsillitis, where normally there is no mutual dependence. This situation may be compared with the high task uncertainty related to the sometimes elaborate search for a possible cancer where almost every speciality might be involved.

Although process planning in some cases is a feasible means for integration, such planning is, in the present structure, often disturbed by cases that need immediate attention, such as patients with sudden instability in vital organs (i.e. acute cases). Such cases not only disrupt pre-planning processes, they also disrupt the non-planned processes. Therefore, differentiation according to time span would increase both action rationality and decision rationality.

**Integration of activities in lateral relations**

In the health care organization, there are overlapping areas of competence, each with its own responsibility for activities involved in problem solving. Responsibility is transferred by issuing referrals to units belonging to different parts of the (differentiated) structure. In cases with high task uncertainty, the capacity to handle task uncertainty is increased through this use of referrals. The use of such lateral relations is mainly an adaptation to a situation where there is very high task uncertainty and no urgency. However, this is decision rationality only in the short term. In the long term, a high degree of lateral relations hampers decision rationality, as knowledge is dispersed throughout the organization. This precludes the systematic gathering of knowledge. Therefore, a high degree of lateral relations both decreases and increases decision rationality, depending on the time perspective. Furthermore, in cases with low task uncertainty such lateral relations induce slack and complexity in the problem-solving processes. Therefore, it seems that the greater the task uncertainty, the more lateral relations are required—and, at the same time, the greater the demand for systematic handling of information.

**Formalization of activities and relations**

In cases with low task uncertainty, process planning and the enforcement of rules and regulations are different tokens of formalization that tend to increase action rationality. Action rationality is therefore encouraged by formal structure and routinization. On the contrary, for cases with high task uncertainty, a way to increase the capacity to handle uncertainty and to increase decision rationality is to encourage de-routinization and a certain amount of anarchy. In principle, sense-making and complex responsive processes are prerequisites for decision rationality in cases with high task uncertainty [24,25]. Therefore, it seems that the greater the task uncertainty, the less appropriate the formalization of the integration.

**Norms for evaluation of activities**

With low task uncertainty, quantitative terms concerning productivity may be used to evaluate problem-solving processes. The question of action rationality, through optimization of the use of resources in problem solving, becomes relevant for processes with low task uncertainty. The norms related to action rationality have led to the introduction of values and measures of production throughput. This means that problem solving is mainly regarded in terms of the amount of resources used. However, with high task uncertainty, the
evaluation of the problem solving may, instead, be made in qualitative terms regarding decision rationality, e.g. through measuring knowledge gained and the development of learning and perception to enhance cognitive processes. For cases with high task uncertainty, the problem-solving processes can hardly be evaluated in the same way as cases with low task uncertainty. Therefore, activities involved in problem solving have to be evaluated according to different criteria, depending on the differences in task uncertainty. At present, uniform criteria and measurements are routinely made through the application of general administrative control systems. Furthermore, ideas related to new public management [3] have put the focus on production. As a consequence of the introduction of production goals and quotas, there is a tendency towards premature routinization of cases with high uncertainty—i.e. action rationality is induced for cases where, primarily, there is a need for decision rationality. Furthermore, when routines are firmly established, perhaps into something resembling an assembly line, these routines tend to be taken for granted and become a barrier to rethinking. As a result, long-term decision rationality may be hampered.

Discussion

The purpose of this report is to put forward the argument that production processes with differences in task uncertainty must be met with differences in organizational structure and evaluated by different performance standards. From a theoretical point of view, this report demonstrates the explanatory value related to the hypothesis about two complementary sides of purpose rationality: decision rationality and action rationality. There seems to be no major contradiction because it is not a question of either/or. The main issue is to find a certain balance between them, and this balance will have to vary with differences in the degree of task uncertainty. The fundamental point here is that, with low task uncertainty, action rationality should assume the dominant role and processes that reduce uncertainty are to be encouraged. With high task uncertainty, decision rationality should dominate and processes that increase the capacity to handle uncertainty are to be encouraged.

In relation to decision theory, the complementary functions of routinization are of particular interest, because an increase in the degree of routinization can sometimes be due to an increased systematization of knowledge (decision rationality), and sometimes it is simply a way to reduce general task uncertainty (action rationality). Therefore, there is no obvious connection between the degree of routinization and the degree of evidence-based knowledge involved in the routines.

From a practical point of view, it can be argued that (under norms of rationality) medical problem-solving processes with high task uncertainty must be performed in a different structure and evaluated according to different standards than processes with low task uncertainty.

In problem-solving processes with low task uncertainty, there is generally an established sequential dependence between activities, and therefore technical resources and skills may be grouped together and administered as self-contained ‘production lines’. To enhance action rationality, the integration may be accomplished through such highly structured network planning of these ‘production lines’ as advocated by Berg et al. [5].

However, in problem-solving processes with high task uncertainty, the main task may be regarded as research related and it becomes important to guard against premature routinization and ‘production-centred’ ideas. This suggests the need to build separate (temporary) problem-solving groups around each type of problem area (i.e. syndromes instead of diagnoses) to ensure the accumulation and systematization of knowledge. At the same time, the norms of research need to be sufficiently stressed to counteract production-centred ideas. Therefore, it is important that performance not be evaluated according to productivity or other quantitative measures.

The argument here contradicts the fairly common ideas regarding the possible benefits of some general introduction of industrial assembly line processes in health care. A similar view on rational medical problem solving was actually expressed as early as 1972 when Cochrane noted that ‘There are too many enthusiastic economists willing to assume that all medical therapy is 100 per cent effective and 100 per cent efficiently deployed in order to justify their hurry to optimise. I hope they will be discouraged’ [21]. So far, his hope seems to be in vain. Of course, routinization and streamlining will increase action rationality, and that will be appropriate in cases with low task uncertainty. In cases with high task uncertainty, the effects of increased streamlining and other tokens of industrialization will simply result in a faster-moving merry-go-round of care.

References


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