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# Cyclical Enterprise System Implementations in Healthcare

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# Cyclical Enterprise System implementations in healthcare

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## ABSTRACT

Combining an incremental approach with the implementation of an Enterprise System (ES) is seen as a kind of catch 22. Vendors and implementers nevertheless lately tend to adhere to cyclical approaches with shortened implementation times. This way of working approaches the incremental philosophy, but also influences the requirements on how the implementation process is managed in perspective of its ambitions. In this paper we derive a framework to explore ambition level and relate it to the used implementation approaches in five hospitals. From the results we first observe a rise in the use of cyclical approaches. Secondly we see a dynamic relationship between implementation approach and ambition level in four of the investigated hospitals. This means that the hospitals start drifting in their ambition level, implementation approach or even both. We conclude that such a drift in most cases leads to implementation problems if not aligned within one implementation cycle.

## Keywords

Enterprise Systems, Cyclical Implementation, Healthcare, Organizational change.

## INTRODUCTION

Lately the actual adoption of incremental or cyclical Enterprise Systems (ES) implementation approaches is slowly beginning to become reality. In the last century the incremental and agile implementation of ES was explained and described (Fichman & Moses, 1995; Stender 1999), but the monolithic technology behind the, at that time called, Enterprise Resource Planning (ERP) systems at first prohibited actual incremental implementation approaches. This technological barrier is only slowly disappearing via the adoption of for example Service Oriented Architectures (SOA) or Software As A Service (SAAS) based solutions, but the problematic implementation track record has forced implementers to come up with adjusted approaches. Currently we see an initial trend (Mezaros & Aston, 2007; Karimi, Somers, & Bhattacharjee, 2007) for system implementers to gradually come up with cyclical implementation approaches. In the perspective of implementation time and cycle usage these approaches more and more come close to the agile philosophy (Alleman, 2002) and do not resemble recurring extensive (re)implementation efforts (Govindaraju, 2002).

In this article we investigate this trend in a specific domain; Healthcare. It is especially this domain that has shown an explainable laggard adoption of ES technology, but it is also especially this domain that could benefit from a more cyclical implementation effort. This can be explained as follows: The use of integrated information technology can significantly facilitate the complex processes in the healthcare domain (Grimson, Stephens, Jung, Grimson, Berry & Pardon, 2001) but a successful implementation of an ES in healthcare requires a quite different approach than that used by “classical” manufacturers (Jenkins and Christenson, 2001). This is mainly caused by the specific distinction between the flexible care processes on the one hand and the structured and repeating operational hospital management processes, like purchasing and controlling (Merode, Groothuis & Hasman, 2004; O'Brien, 2003). This distinction on the one hand was seen as impeding and complicating the implementation process. On the other hand we currently see that this typical characteristic is becoming a foundation for cyclical implementation efforts. Hospitals and care providers seem to follow different strategies to accomplish this achievement and we see distinctive solutions (Khoumbati, Themistocleous & Irani, 2006) leading to different outcomes (Soh, Kien & Tay-Yap, 2000).

Our contribution is twofold. First we contribute with health specific ES implementation research. There is an elaborate knowledge base on the adoption of ES in the business domain. The rising popularity of this specific technology for the care domain urges our research community to transfer the results from the generic business domain to the public domain of care organizations. Secondly the combined research on implementation ambition and used implementation approach is scarce in the ES domain. There is a tradition in the IS field on the employment of system development methodologies, but the corroborative knowledge from this domain only slowly trickles into the ES domain. Our paper is structured as follows. Section 2 introduces the theoretical background and explicates our research framework. The employment of our research framework, including our research methods, is explained in the research approach in section 3. This is followed by the individual -and cross case analysis in section 4. We close our contribution in section 5, by concluding our research results.

## BACKGROUND/THEORETICAL FRAMEWORK

### Enterprise Systems in Healthcare

Since the beginning of this century ES vendors have been improving the healthcare specific functionality considerably and to still conclude that ES systems are not suited for hospitals would not be correct (Merode et al., 2004). Large ES vendors acquired care specific IS solutions and the larger healthcare specific vendors introduced ES themselves. Similar to the industrial domain hospitals and care providers should evaluate their ambitions; critically deliberate the capabilities of the ES, but also the capabilities of the organization in changing their process, structure and working routines. Hospitals are faced with a choice between adopting the ES package to support its back office processes or increase their ambition and deliberately choose to also use the ES to support its main care processes. This latter adoption will certainly lead to extensive organizational changes for the entire organization and for the health professionals in particular process (Merode et al., 2004, Soh et al., 2000). Extensive literature and experiences from ES implementations have shown the support and facilitation of this change process is essential (Besson and Row, 2001). Current ES implementations are accompanied with extensive methodologies. These implementation methodologies are vast toolsets and one would expect a relationship between the ambition level and followed implementation approach (Brown and Vessey, 1999). We intend to investigate how hospitals succeed in aligning the chosen ambition level and the followed implementation approach. The specific setting of the healthcare domain makes this research relevant for organizations in which there is a typical distinction between deterministic supporting processes and more flexible operational process. Typical examples of such organizations are universities, hospitals, consulting or legal organizations where the professional level of the operational employees is high.

### ES Implementation approaches versus implementation ambitions

The term ES Implementation approach explicates how the collective of hospital members and implementation partner (either internal or external consultants) proceeds during the IT enabled change process. ES implementations due to their complexity and track record are accompanied with extensive implementation methodologies (Fleisch et al., 2004). These methodologies mostly have a dominant paradigm (Avison and Fitzgerald, 2002) but their employment is influenced by the adoption of the method by the practitioners (Aydin and Harmsen, 2002, Hirschheim and Klein, 1989) Based on this argumentation (Goles and Hirschheim, 2000) simplify the perspective on adoption of methodologies between functionalism and interpretativism as two illustrating extremes through which practitioners adopt and employ the implementation practice. We observe resemblances between these two extremes and developments in both American as well as European organizational change literature (Beer and Nohria., 2000, Boonstra, 2004). In practice paradigm blends do appear. Such multiparadigmatic approaches (Mingers, 2001) can be discerned in the IS domain where practitioners adopt to a different way of working and thinking as *a way to mitigate the rigidity of the functionalist approach* (pp.1213 (Hirschheim and Klein, 1989)). In the organizational change domain these multiparadigmatic approaches are called integral and described as *“commuting between design and development”* (Boonstra, 2004). Based on the collective notions from the IS domain (Gulledge and Simon, 2005, Goles and Hirschheim, 2000) and the organizational change literature (Beer and Nohria, 2000) three main streams can be discerned to describe the distinctive employment of methodologies during the ES implementation process:

1. Functionalistic
2. Integral
3. Interpretative

To explicate ambition level this study continues the traditional model of IT change, well known as the alignment model (Henderson and Venkatraman, 1994). Several contributors have extended or enhanced the IT enabled change model. The lack of a dynamic process perspective was explicated by (Hsiao and Ormerod, 1998) arguing it was too static. Henderson and Venkatraman (Henderson and Venkatraman, 1994) already foresaw that by referring “alignment is not a simple combination of static objectives”. Yetton, Johnston, & Craig (Yetton et al. 1994) demonstrate three alternative paths while (Hsiao and Ormerod, 1998), suggest four further change patterns or archetypes. From the corroborative findings of both latter scholars the initiative and movement behind these change processes are specified as the notions of “driver” and “lever”. These notions in the ES implementation domain are defined under “implementation scope” (Parr and Shanks, 2000), but this concept is merely focused on the project management -and technical implementation issues. The implementation of ES in the healthcare domain is challenged with the distinctive ‘front office’ care processes and ‘back office’ hospitals operations management. To pay attention to this organizational change aspect we extend scope and use the notion of implementation ambition (Wijnhoven, Spil, Stegwee & Rachel, 2006). Implementation ambition encompasses the elements of projects scope, but also the subsequent organizational change process (Markus, 2004, Bartunek and Moch, 1987). The three distinctive archetypes from (Yetton et al., 1994) in the perspective of the ES implementation process results in three distinctive ambition levels (Brown and Vessey, 1999; Katsma, 2008; Parr and Shanks, 2000):

1. Replacement
2. Re-engineering
3. Renewal

These three will be further explained in the respective hypotheses that we derive after the introduction of our model that relate the implementation approach with implementation ambition. Figure 1 shows our model where both legs are combined as an oblong space in which implementations can take place.

		Implementation Approach		
		Functionalistic	Integral	Interpretative
Implementation ambition	Renewal	P4		P3
	Reengineering		P2	
	Replacement	P1		P4

**Figure 1 Alignment between ambition and implementation approach.**

In line with the dynamic continuation of the MIT alignment model by (Yetton et al., 1994) and the empirical results from Fleisch, Österle, & Powell (2004) we assume implementations can move throughout this space. This phenomenon continues the line of thought described in (Ward, Hemmingway & Daniel, 2005), is based on the cyclic approach to ES implementations (Markus and Tanis, 2000) and the experiences from subsequent ES implementation studies by (Fleisch et al., 2004). For example, a hospital may start a reengineering effort using a functionalistic approach, but during the implementation process redefine their ambition or adopt another approach. But subsequent finished implementation efforts also can be depicted one after another in this figure. Our model is explorative and our research objective is to investigate how implementation approaches relate to project ambitions in healthcare. In the next section we introduce three implementation combinations. Each combination will be extensively explained based on various empirical results from (Bancroft, Seip, Sprengel, 1998; Beretta, 2002; Brown & Vessey, 1999; Fleisch et al., 2004; Robey, Ross & Boudreau, 2002). To continue and extend this existing implementation knowledge base we derive a hypothesis (Glaser & Strauss, 1967) for each type, P1 – P3, that lie on the diagonal in the oblong space.

### **P1 Replacement ambition with a Functionalistic Approach**

This implementation type explicitly focuses on the replacement of existing information systems without altering the organizational structure or the business process logic. In this study replacement automatically means integration of existing legacy systems, because this is one of the typical characteristics of an ES. We call this type IT Driven Replacement (IDR), but it is also known as IS-oriented approach (Fleisch et al., 2004). The initiative for this implementation can stem from IT or financial management, because running systems either become too expensive in their servicing or even impossible to maintain due to termination of vendor support. This implementation mode explicitly is not aimed on reengineering working processes or activities. In that sense it can be classified as a 1<sup>st</sup> order change process (Bartunek and Moch, 1987) with no changes within the existing cognitive frame of the employees. Considering the implementation approach functional system training will be inevitable, but the changes on the job will be moderate. The organizational impact is limited to major changes on the information system level, but organizational structure, culture, beliefs and behaviour are not affected in this implementation type (Bancroft et al. 1998). This type sometimes is the starting point of a deliberately chosen two-stage strategy to implement an ES in which reengineering ambitions explicitly are delayed to the second stage. Through a pragmatic implementation, using standards and with minimal process changes, the ES is live in relative short notice. The experiences and learning outcomes from this pragmatic implementation are then used as a step stone for the second extensive implementation experience (Markus and Tanis, 2000, Fleisch et al., 2004; Beretta, 2002). From these empirical results we derive our first proposition:

*P1 – Given a replacement ambition we expect a functionalist approach for the ES implementation*

### **P2 Reengineering ambition with an Integral Approach**

Central to the original Business Process Engineering (BPR) concept stands a holistic concept to strategy, structure, process, people and technology. The commercial application of the BPR concept nevertheless soon narrowed the use of IT as the main enabler for BPR. This type is called Package Enabled Reengineering (PER). During this type of ES implementation a new situation is designed and best practices are used. This ambition level extends the prior IDR type comprehensively. The starting point is fundamentally different. IDR is about system replacement. The PER implementation aspires to transform the organization by reengineering processes and organizational structure using the ES as enabler. To adopt the new ways of working in the different organizational structure the organizational members are required to reframe their cognitive frames. This is a typical 2<sup>nd</sup> order change process (Bartunek and Moch, 1987). These technological driven change processes have shown to be well supported by integral approaches that pay attention to learning and competence development that go hand in hand (are integrated) with redesign and technological innovation (Boonstra & Vink, 1996). Considering the implementation methodology it requires an integral alternating approach that supports the typical dialectics of the change process (Robey et al. 2002). This approach should pay attention to changes on the aspects technology and structure (e.g. new information systems, different business processes, different organizational structure including other responsibilities, authorizations and tasks). But it also should pay attention to individual changes (competences, behaviour, attitude, social interactions and cognitive schemata) as well as group wise changes (culture, shared schemata and values) (Boudreau and Robey, 1996). Based on the corroborative knowledge explained in this section we derive our second proposition:

*P2 - Given a reengineering ambition we expect an integral approach for the ES implementation*

### **P3 Renewal with an Interpretative Approach**

The rationale behind Human Driven Renewal (HDR) is the emergent change practice in which the organizational members innovate and adapt the information system including its accompanying working processes to its needs (Desanctis and Poole, 1994). The users perceive the technology as emergent and improvised in diverse ways. These models tend to assume that the process of technological adaptation is ongoing and continuous rather than discontinuous, radical, and, often, periodic developments (Orlikowski and Hoffman, 1997). This type reflects a 3<sup>rd</sup> order change process (Bartunek and Moch, 1987). This bottom up, emergent change process by definition describes not only the change process itself but also the organizational form and capabilities. The organizational structure enables experimenting, self-learning and innovation. The organizational members themselves are able to recognize the needs for change, have enough skills, competences and change capabilities to shape the change process and the ES technology helps them to achieve their ambitions gradually. This can be

compared to the learning organization or learning renewal (Boonstra, 2004). ES technology mostly is monolithic and complex and the implementation process often is a planned staged change effort that complicates the agile adoption of technology (Fichman and Moses, 1999). Nevertheless we see that ES vendors starts to embrace this way of incremental package implementations and try to make the necessary adjustments to the latest ES technology. Though immature in being, still this type is relevant in the perspective of the cyclical ES experience (Markus and Tanis, 2000). Organizations that have adopted an ES may initiate reimplementation initiatives to improve due to changing circumstances or insights from the organization itself. One of the required circumstances is a shared organizational change capability that is typical for 3<sup>rd</sup> order change. This renewal ambition should not be misunderstood as the gradual introduction of new system releases by vendors. It is the organizations internal change -and innovation capability to start up reimplementation programs. Based on these phenomena we derive the third hypothesis

*P3 - Given a renewal ambition we expect an interpretative approach for the ES implementation.*

In the prior section we explained there is extensive empirical evidence behind the illustrated three combinations of implementation approach -and ambition. Based on this line of reasoning and in addition to these three we derive a fourth hypothesis (shaded planes in Figure 1).

*P4 If the ES implementation ambition does not align with the approach we expect a change in ambition or approach.*

## RESEARCH METHOD

The previous section has shown that there is not much specific literature on ES in healthcare and that much of the literature is explorative and practice oriented. We were able to draw a theory from industry but this makes us uncertain with respect to the validity of the model in healthcare. To further develop the theoretical insights on the possible relations among ambition and implementation approach of ES in healthcare we decided to conduct case studies (Glaser and Strauss, 1967) and (Yin, 2003). The Dutch health industry is interesting from an ES perspective, because the government and health insurance firms are 'forcing' hospitals to reduce costs and maintain and increase the service levels offered at the same time. The need for hospitals to integrate and rethink their legacy systems is also recognized internationally (Stegwee and Spil, 2001). Hospitals are also relevant for this study because of the large IT investments they require, and thus the high complexities that may appear in the information systems. With the help of purposive sampling (Babbie & Mouton, 2001) five academic hospitals in the Netherlands were selected according to a specific set of criteria (Figure 2). These criteria include homogeneity of the hospitals, maturity of the ES solution and the stage of the implementation progress. During the investigations seven hospitals in the Netherlands meet these criteria. From this group five hospitals were willing to participate in the study by interviews and making relevant documents available.

<i>Requirement</i>	<i>Realization</i>
Homogeneity of hospitals	Each case is a Dutch hospital.
Maturity of ES solution	Multidisciplinary implementation of the ES (exceeding logistic and financial modules and including care specific functionality)
Progress of the ES Implementation	The implementation process is progressed past "go-live" for at least two specialties.

**Figure 2. Hospital selection criteria**

To test our hypotheses we created a qualitative interview framework based on (Miles and Huberman, 1994). We developed a data collection procedure that consists of minimal one interview with a main project member (i.e. administrative staff as well as health care professionals or doctors) and in most cases more, up to 3 interviews. For each case a document analysis was done. More concretely we asked the project members in an open interview to reflect on the implementation process itself. How participation was organized, how the change and learning process was facilitated and which problems arose? Secondly the implementation objectives were asked including the possible development of these objectives during the implementation

process. Next to that also on an individual level people were asked about their expectations on the ES implementation and their final evaluation of their new working environment.

## RESULTS AND ANALYSIS

Five hospitals were studied to explore the alignment between ambition and approach of ES implementations. Figure 3 shows the summarized empirical results. In our investigations we analyzed cyclical implementation efforts in four cases (see Figure 4). Only Case A performed a singular implementation effort whereas cases B and D are at the end of its first cycle. For hospital B it was not possible to implement the medical module with the approach used. The ambition did not fit the approach and so the ambition was lowered during the process. Case D is somewhat special. We observe the same situation as case B, but in this hospital the result is more severe: relatively short after Go live the entire ES is abandoned. A possible reason for this seems to be the omission of user participation that is known to be a major success factor in ES implementations.

Case E is a learning process starting already in 1995 with a functionalistic approach and an increasing ambition level. The hospital learns by doing and cycle after cycle slowly moves to a more integral approach.

The movement of cases B and D only confirms that ambitions in the healthcare domain may rise, but the actual accomplishment still is disappointing. When we inspect this typical movement in our framework it appears hospitals have great difficulties to persevere a specific combination of approach and ambition within one implementation. Only case A resides in the lowest left quadrant.

Four hospitals that strive for a Package Enabled Re-engineering ambition face difficulties to persevere as we have seen in case C where ambition goes up but the approach returns to a functionalistic type. Participants report a negative perception of this movement. Hospital E shows a more fruitful route that confirms our basic rationale behind this research. It follows the diagonal of the research model, but this takes a lot of time. Hospital E is doing so since 1995.

	Case A	Case B	Case C	Case D	Case E
<b>Number of cycles</b>	◦ 1	◦ 1	◦ 2	◦ 2 (ES discontinued)	◦ Multiple
<b>Initial Ambition</b>	◦ Replacement of legacy systems after merger	◦ Realization of a new Hospital Information System	◦ Improve workflow of healthcare processes	◦ Addition of care specific modules and possibly reengineering of existing ES	◦ Full implementation of an ES
<b>Implementation Approach</b>	◦ Software oriented and firm approach by the vendor ◦ Testing and training planned, but not realised	◦ Functionalistic approach, sometimes indifferent to org. members ◦ Late training of the users	◦ Functionalistic and structured approach ◦ Much communication with end users	◦ Functional design with many changes to the standard package ◦ Small amount of user involvement	◦ Standard waterfall method ◦ Functionalistic perspective ◦ Good user involvement
<b>Implementation Result</b>	◦ Integration plus management information	◦ Partly changed processes in administration ◦ No success in care.	◦ Most targets reached but the ambition level is increased continuously. (Project still continuing)	◦ Straightforward implementation but no satisfaction with end product. ◦ Disposal of ES.	◦ Partly satisfied. (Project still continuing)

Figure 3. Summary of empiric results

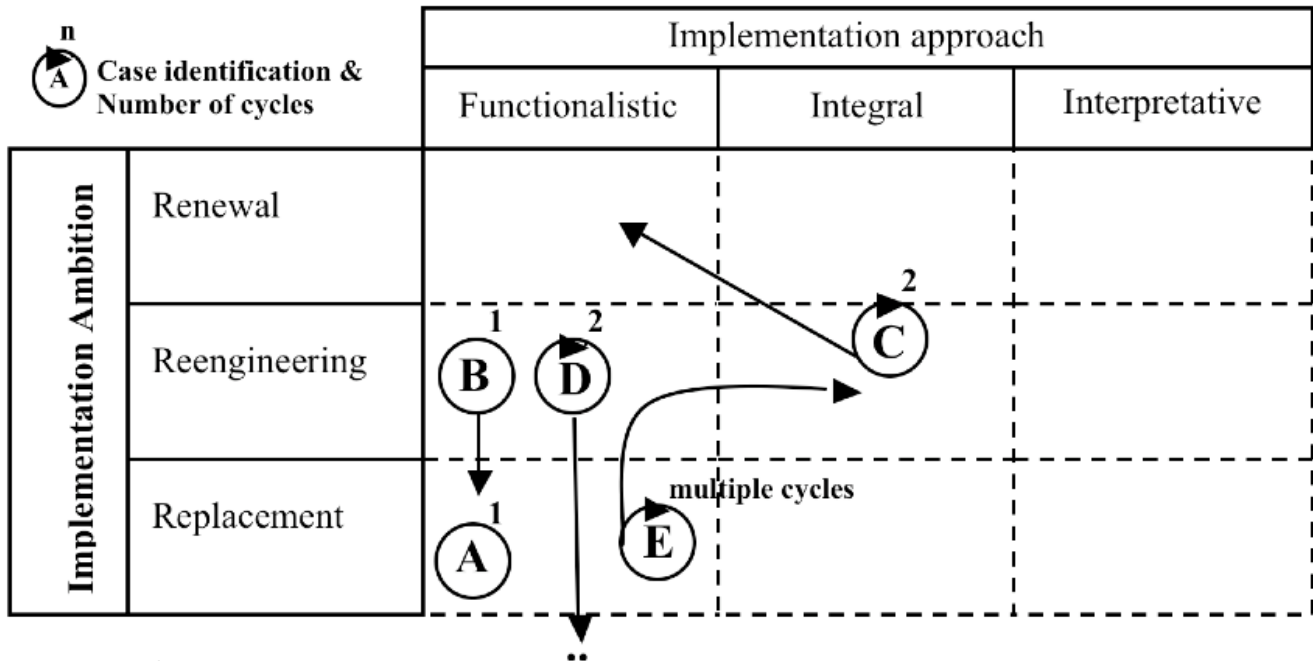


Figure 4. Analysis results

Reflecting upon our propositions we can conclude the following:

Case A supports proposition 1: *Given a replacement ambition we expect a functionalist approach for the ES implementation.* Without too much trouble, the back office administrative modules of the Hospital Information System were replaced with a functionalistic approach. Explicitly choices were made not too move toward a medical module or use an integral approach.

Proposition 2: *Given a reengineering ambition we expect an integral approach for the ES implementation,* is supported by Case C. An integral approach leads to a successful re-engineering process. During the process, the ambition even gets higher but the approach falls back to a functionalistic one. We receive first indications this is not the right direction. Participants report an increase in a negative perception of the followed approach. This case is still running, but follow up research is necessary to investigate the dynamics in this case and its results.

There is no case supporting or denying proposition 3: *Given a renewal ambition we expect an interpretative approach for the ES implementation.* There are also no cases moving into that direction.

Finally, cases B, D and E support proposition 4: *If the ES implementation ambition does not align with the approach we expect a change in ambition or approach.*

**CONCLUSIONS**

Our main research ambition was to test our framework to describe cyclical ES implementations in the specific healthcare situation and gain deeper insight knowledge on the underlying processes. We first observe that only one hospital adopts an IT- Driven Replacement ambition. From our investigated cases we can conclude that hospitals start initiatives to implement ES as full functional integrated solution. It is aimed to support both deterministic back office processes, but also the more flexible operational care process. This is a significant change compared to the beginning era of ERP implementations in hospitals. A renewal ambition seems a bridge too far for healthcare organizations at this point in time when implementing an ES. This still is inherently tied to the monolithic ES technology and the low amount of existing ES adoptions in the health care domain. This result is not specific for the healthcare domain alone, because many examples from industry support the



observation that Human Driven Renewal is very difficult to accomplish in the ES domain. Industry nevertheless still is far ahead when we inspect the number of reengineering based ES implementations compared to the healthcare domain.

Considering our framework we can conclude that explicit attention is necessary to depict cyclical subsequent implementations versus one-time implementation efforts. The framework is able to display the movements during an implementation and show both researchers and practitioners these specific characteristics. Practitioners also may use it beforehand as tool to create a common understanding for the initiated implementation approach in relationship with the ambition level of the implementation. Nevertheless this concept should be perceived as illustrative and further research is necessary on the prescriptive application of the framework.

There are some limitations in this research due to the fact that all investigated hospitals are situated in the Netherlands. The Dutch situation restricts hospitals as public care providers, therefore only a careful extrapolation towards for example privately financed institutes may be possible. Further research is necessary in different countries, but also a replication of our model in industry is recommended.

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