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Evolutionistic or revolutionary paths? A PACS maturity model for strategic situational planning

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ABSTRACT

Purpose: While many hospitals are re-evaluating their current Picture Archiving and Communication System (PACS), few have a mature strategy for PACS deployment. Furthermore, strategies for implementation, strategic and situational planning methods for the evolution of PACS maturity are scarce in the scientific literature. Consequently, in this paper we propose a strategic planning method for PACS deployment. This method builds upon a PACS maturity model (PMM), based on the elaboration of the strategic alignment concept and the maturity growth path concept previously developed in the PACS domain.

Methods: First, we review the literature on strategic planning for information systems and information technology and PACS maturity. Secondly, the PMM is extended by applying four different strategic perspectives of the Strategic Alignment Frameworkwhereupon two types of growth paths (evolutionistic and revolutionary) are applied that focus on a roadmap for PMM. This roadmap builds a path to get from one level of maturity and evolve to the next.

Results: An extended method for PACS strategic planning is developed. This method defines eight distinctive strategies for PACS strategic situational planning that allow decision makers in hospitals to decide which approach best suits their hospitals' current situation and future ambition and what in principle is needed to evolve through the different maturity levels.

Conclusions: The proposed method allows hospitals to strategically plan for PACS maturation. It is situational in that the required investments and activities depend on the alignment between the hospital strategy and the selected growth path. The inclusion of both strategic alignment and maturity growth path concepts make the planning method rigorous, and provide a framework for further empirical research and clinical practice.

INTRODUCTION

The first Picture Archiving and Communication System (PACS) was introduced more than two decades ago to reduce reliance on film-based radiology departments [1]. PACS has since become an integrated component of today's healthcare delivery system [2]. The introduction of PACS within hospital practice has significantly changed the working practices of radiologist and end-users of the system [3,4]. Achieving this type of filmless environment with PACS is also a highcost venture, however [5]**.** PACS is well matured and offers customized archiving solutions and reading stations that fulfil the needs of most users [5–8]. More efficient, extensive, cost-effective, scalable and vendor independent infrastructure PACS solutions

have been developed, to overcome the technical and practical limitations of current operational file systems (e.g. Unix) and PACS database design [9,10]. However, the majority of commercial PACS vendors have developed PACS specifically for radiology and need to change the structure of current systems to extend PACS towards other specialties (e.g. cardiology, dermatology, ophthalmology, surgery, haematology, pathology, neurophysiology, digestive, orthopaedics, obstetrics, gynaecology, allergology, urology and pneumology) [6,10]**.** Many hospitals attempting to extend PACS beyond radiology take this as an opportunity to re-evaluate their current systems and are looking to replace their original imaging networks with state-of-the-art equipment to improve overall system performance [11]. Moreover, many hospitals who have 5–7 years of experience with PACS, are planning for major upgrades or have already migrated to a new PACS vendor [12]. This upgrade development is driven by the current volume of imaging data produced by modalities like CT's and MR's that have major impact on the common architecture**.** The selection of a (new) PACS vendor should go beyond purely financial considerations [13] and be based on a deliberate consideration concerning project responsibility, compatibility, standardization, ease of upgrading and updating, as well as service and maintenance [14]. However, in the vendor selection and purchasing strategy process often important criteria such as detailed specification and descriptions of operational functionality, project documentation and adequate specificity in the contract are forgotten [15]**.** PACS directly affects patient care, (clinical)workflowand clinical effectiveness [16]. As the importance of imaging technology and the radiology practice grows and evolves, the importance of strategic direction and preparation for the future are becoming more significant [17]**.** In practice, we see that a strategic planning approach towards PACS and PACS (re)deployment is lacking, both in hospital board rooms and in the literature. There are case study examples about the implementation of PACS and the conversion to digital imaging [18,19]. The Baltimore VA Medical Centre for instance, is such a well documented PACS implementation case. It describes the implementation process over the years and the subsequent maturation and evolvability of the PACS into a larger healthcare imaging system and ePR from the beginning [7,20,21]. The strategic alignment between PACS and the hospital enterprise is not addressed, however, nor is the strategy process behind the PACS deployment and its critical conditions.Most contributions in the domain of strategic plans for PACS solely elaborate on the transition from a non-PACS environment towards a fully digital radiology and diagnostic imaging environment [7,22,23]. While the parts concerning the operational planning of a PACS are addressed, the strategic/situational investment and activity steps required to evolve from the current system implementation (as-is) towards a higher level ofmaturity are not**.** Given the above, the main objective of this paper is to develop a method for hospitals that enables the strategic planning of PACS deployment. The method put forward is based on the elaboration of the PACS Maturity model (PMM) [24] through the strategic alignment concept and the maturity growth path concept. By combining both concepts we propose a framework and method for the alignment of PACS development and hospital strategy that is more likely to be achieved in practice. This framework can be used for both further empirical research and practical application**.**

THE PACS MATURITY MODEL

Several maturity models have been developed to measure, plan and monitor the evolution of Information Technology or Information Systems (IS/IT) in organizations.Within this field Nolan and Gibson [25,26] are considered the founders of the IS/IT stage-based maturity perspective that has been further extended by others [27,28]. Examples of maturity models are theCapability Maturity Model for software development [29], the Supply Chain Management Maturity Models [30], the Business Process Orientation Maturity Model [31], the Maturity model for interoperability in digital government and so on. For PACS, Van de Wetering and Batenburg developed the PMM [PMM; 24]. Based on a literature review of 34 scientific papers on PACS development and a subsequent meta-analysis, they found three general streams in PACS maturity and evolution: (1) radiological and hospital- wide process improvements, (2) integration optimization and innovation and (3) Enterprise PACS and the electronic patient record. From this, they defined five levels of PACS maturity that hospital enterprises can achieve:

- Level 1: PACS Infrastructure;
- Level 2: PACS process;
- Level 3: Clinical Process Capability;

• Level 4: Integrated managed innovation;
• Level 5: Optimized Enterprise PACS Chain.

These PACS maturity levels are defined by their increasing process focus. With the progression towards maturity level 5, operational (workflow) efficiencies, IS/IT-integration and qualitative care using PACS technology expand. Additionally, the level of retrieving more timely and accurate information for clinicians, physicians and hospital management increase as well. At the highest levels, processes are effectively redesigned and underlying clinical processes and workflows are optimized, supported by the integration of PACS within a larger hospital enterprise (strategy) and the Electronic Patient Record (ePR). It is at the optimized enterprise PACS chain level where PACS is fully integrated into the ePR that PACS can be maximized for efficiency purposes and clinical effectiveness. The PMM is a descriptive, partly normative model that is, as of now, not explicitly developed as a guideline for strategic planning, nor is it made situational for different factors and conditions.Although themodel can be interpreted as a straightforward (i.e. sequential) accumulation of PACS investments, it is not defined which steps need to be taken to cross-maturity levels. Also, the development through the maturity model might differ in pace, and in the 'optimal' cross-cutting route. Both shortcomings will be addressed in the next two sections.

EXTENDING THE PMM: STRATEGIC ALIGNMENT

Strategic alignment is a central element of strategic planning, the process by which organizations develop and deploy a competitive, long-term strategy in which internal resources are integrated into external opportunities. The process for strategic IS/IT planning has been first addressed by King and Cleland [32]. They suggest that the highest level of 'sophistication for strategic planning for information systems' should meet three criteria: (1) it should incorporate processes for relating IS strategy to the existing business strategy of the enterprise, such that a significant change in business strategy would require a significant change in IS strategy, (2) it should explicitly incorporate processes for assessing the existing and planned IS resources of the organization with the objectives of identifying potentially useful changes in the business strategy, tactics, or the processes that they may support, and (3) it should govern information and information systems as a strategic resource or competitive weapon, and explicitly involves processes for the identification of opportunities for the use of the information resource [33]. As of now, the common term for strategic alignment is business-IT alignment, a broad and widely used concept that aims to optimize the organizational benefits from IS/IT at the strategic and operational level, as well as the mutual adaptation of the business and IT domain [34]. Undoubtedly the most cited concept in the field is the Strategic Alignment Model (SAM) by Henderson and Venkatraman [35], and extended by others [36]. The SAMwas driven by the difficulty of many organization during the nineties to create value from investments in IT/IS because of the lack of alignment between the business and IT strategy. The authors claim that a dynamic process is needed to ensure continuous alignment between the business and IT/IS domains, to achieve 'strategic fit' as well as 'functional integration'. This is illustrated in Fig. 1, which shows the linkages between four quadrants that emerge from combining the business and IT domain on the one hand, and the external (i.e. strategic) and internal (i.e. operational) domain on the other. The quadrants of the SAM can be connected in several ways, illustrated by four different strategic perspectives or paths. Each path describes a perspective that addresses the two linkages (strategic fit and functional integration) to realize business-IT alignment. Plans and actions based on the four perspectives should envision strategic alignment by applying the 'one that fits best' of the four perspectives, each with its own starting point (anchor), mean (pivot) and effect domain (target) [37]. These perspectives differ by the path they define to 'walk' over the alignment model. Henderson and Venkatraman [35] stress that neither of these perspectives is superior to one another: "If they were, it would not be strategic because all firms would adopt it" (p. 482). The key in really creating a competitive advantage therefore lies in choosing the right perspective for the right situation. If we apply the SAM and the four distinct perspectives by Henderson andVenkatraman to thePMMas described above, the following can be derived:

1. The first perspective (path "1" in Fig. 1) is labelled by the authors as the Strategy Execution perspective. Business strategy is the main driver for all organizational and IT infrastructural choices. This perspective defines the role of top management (business) as the strategy formulator and IT management's role is that of strategy implementer. The IT function is primarily seen as a cost/-service centre for the

organizational processes and infrastructure**.** Applied to the PACS domain, this perspective implies that investments and innovation are restricted by budgets that are defined by the hospital board. The hospital board might develop strategic actions that touch the role of PACS within the organization, butmost likely the maturation of PACS as such is not prioritized. In this perspective, PACS is a typical 'supportive' or 'key operational application' [34]**.**

2. The second perspective (path "2" in Fig. 1), is the Technology Potential perspective. Here the business strategy is explicitly aligned with the IT strategy in order to support the chosen business strategy with the accompanying specification of the required IS infrastructure, systems configuration and processes for system development and maintenance. An organization that follows this perspective seeks technology leadership to differentiate from its competitors. IT is seen as imperative to support the business, but the business is still leading on a strategic level**.** In this perspective, PACS can become part of strategic considerations if the hospital board aims to innovate and integrate the organization from a process perspective taking into account the scope of PACS within the hospital enterprise and system competences that better support existing business strategy**.**

3. Competitive Potential is the third perspective (path "3" in Fig. 1). As in the previous approach, business and IT strategy are aligned, but now the top management views IT as the primary catalyst (driver) for changing the organization**.** This approach allows IT to change the business based on new technologies and opportunities, while the business still decides which technologies to implement**.** PACS can be such an IT-driver with 'competitive potential' (or: high potential) but this obviously requires top management support and explicit investments within the hospital enterprise. PACS needs to be internally positioned in such a way that it can actually drive chain optimization and thereby influencing the distinctive competences of the business strategy**.**

4. The fourth and last perspective (path "4" in Fig. 1) is the Service Level perspective. Here the aim is to reach a world class IT service organization ensuring effective deployment and optimal use of IT resources and be optimally responsive to the demands of end-users. The IT strategy leads the internal design of the IT infrastructure and subsequently the organizational processes. In contrast with the other perspectives, the role of business strategy drive is indirect. In this approach, thematuration and deployment of PACS can be leading too. In contrast to the Competitive Potential perspective, alignment with the hospital strategy is less important. This implies that PACS can be deployed as a direct driver for operational processes and/or change**.**

In overview, the four perspectives describe four types of alignment between the business and IT domain. Two perspectives (Technology Potential and Competitive Potential) are based on a strategic fit between business and IT, meaning that it will depend crucially on the strategic agenda and support of senior management if PACS is to be matured to the highest levels. The other two perspectives (Strategy Execution and Service Level) are based on functional integration, meaning that PACS can either be leading or following within the hospital enterprise (i.e. high potential or bound to maturation)**.**

[FIGURE 1]

Extending the PMM: growth paths

In section "The PACS maturity model", we referred to several stage-based maturity models, including the PMM. After extending this model with four different perspectives on strategic alignment (that actually condition the PMM), this section focuses on a roadmap for PMM, that is, how to get from one level ofmaturity and evolve to the next [27]. While organizations tend to evolve from one stage to the next, some organization take strategic leaps and evolve to higher levels of development [38]. Gluck et al. [39] indicate that formal strategic planning does indeed evolve along similar lines and phases among different organizations, with accompanying effectiveness of strategic decision making. This maturity process takes place at varying rates of progress and is different for each organization operating in a different market, see also [40]**.** As was shows in section "The PACS maturity model", the PMM assumes that levels have a sequential, accumulated, relationship with each other. The next question is obviously how hospitals actually realize this maturation and evolvability in terms of steps and accompanied actions, to reach a higher level of maturity. This requires detailed investment planning focused on realizing transitions in practice**.** Growth paths can be considered as an extended method for the management of transitions that are needed to evolve

through the PACS maturity levels. As outlined by the previous section, growth and evolvability requires strategic vision and planning. Synthesizing from literature on the underlying premises of PACS, case studies and practical experiences of hospitals with PACS deployment, we believe that two main growth paths can be gleaned:

A. Evolutionist growth paths: evolutionist growth paths (or: plateau planning) develop logically in stages. These stages followone another based on predefined objectives and goals. Each of the PACS maturity levels is a precursor for the next level, so that the structures on which the current PACS rest undergo little change with movement to the next level. Thus, the evolutionist growth path is defined as going from PACS Maturity level 1 to Level 2, from 2 to level 3 and so on (as indicated in Fig. 2 with small arrows). Such an evolutionist growth path should not be interchanged with the evolutionary concept [41]. Evolutionary concepts focus more on mechanisms and processes by which changes occur and new characteristics of entities come into being, resulting in a new states of equilibrium [see also 42]. The evolutionist approach follows the philosophy of total and continuous quality management in which incremental process improvement is achieved [43,44].

B. Revolutionary growth paths: revolutionary growth paths take a more radical approach in that it takes strategic 'leaps' in order to evolve to higher levels of PACSmaturity (see Fig. 2). Such a path introduces a radical change and process focus for the hospital and does not follow the logic of monotonous sequential development, i.e. that stages follow one another by definition. Rather revolutionary paths take leaps to higher maturity levels skipping intermediary maturity levels [38]. It requires strategic deliberation to implement such radical process changes. These paths follow the ideology of Business Process Reengineering and Business Process Innovation that had high impacts in previous decades [44,45]. Revolutionary does not mean, however, that the intermediary levels (and their associated elements and deployment activities) are not addressed in a strategic plan. For instance, the transition from maturity level 2 to level 5 is revolutionary in that it 'leaps' over the intermediary maturity levels, but still requires that all the matured levels are addressed, either in aggregate or specifically.

Since hospital strategic planning processes are formed on the basis of internal, external, market-driven and non-marketdriven components [46], they are thus situational. Activities for each growth path to realize a specified maturity transition are likewise conditional on given situations such as the given PACS's state ofmaturity and the specified strategic alignment direction. In other words, specified growth paths depend on what is required to realize transition towards higher levels of PACS maturity. In our view, a desired maturity level cannot be achieved without conscientiously governing and addressing all process focussed elementswith inevitable investments and deployment activities at each of the intermediary maturity levels. This does not favour either an evolutionistic or revolutionary growth path (or a combination), it does, however, imply that careful consideration is required when choosing a strategic direction. Hence, growth paths capture an important dimension of strategic planning for PACS.

[FIGURE 2]

Towards a situational and strategic planning method for PACS

Now that we have described the concepts of strategic alignment and roadmaps as extensions of the PMM,the next step is to elucidate these into a strategic planning method for PACS. We define eight strategies that are based on the combination of the 'four' original perspectives that envision strategic alignment (strategy execution, technology potential, competitive potential and service level) with two types of growth paths (evolutionistic and revolutionary). These eight strategies build the decision space: an extended method for PACS strategic planning. The eight strategies are summarized in Table 1. The table serves as a decision framework for decision-makers in order to choose a strategic direction and deploy PACS towards a desired level of maturity. The distinctive strategies defined by the framework incorporate the triangle construct of the Strategic Alignment Model. It encompasses the three quadrants of the strategic alignment model, and addresses the principles of strategic fit and functional integration simultaneously. This first enables decision-makers to select a clear strategic direction, by taking the business or the IT domain as the anchor point. Secondly, decision-makers are guided to decide how to travel in this direction (the growth path), given the hospital resources and competencies. This decision is more internally and operationally oriented. In order to differentiate between the strategic perspectives and being able to select

the growth path that bestmeets a hospitals' current and future needs, we suggest the following 3 steps to be taken:

1. Assess the current maturity state of PACS and also a "to-be" situation should be determined using the PMM involving multiple stakeholders (e.g. radiologists, management, technicians, referring physicians, etc.).
2. Second is a fit-gap analysis that determines whether the current maturity level is either a precursor for the "to-be" situation, or the desired maturity level 'leaps' over intermediary stages. At this stage it needs to be decided whether the growth path follows an incremental improvement process (evolutionistic), radical changes (revolutionary) or a hybrid combination of the two. In terms of strategy, this decision implies if hospital structure and PACS process focus and/or persist on the previous chosen path by retaining current strategies and structures.
3. A third step is deciding which of the four strategic approaches best suits the current hospitals' situation and future ambition in order to realize strategic alignment, and translate these in terms of steps and accompanied actions.

Both the 'Technology potential' and 'Competitive potential' strategy (that are both based on a strategic fit between business and IT) depend on the strategic agenda and support of senior management. Pursuing the Technology potential strategy (triangle construct) to reach a desired level of maturity fits best if the hospital—driven by hospital strategy—is aiming for a more reliable and extended PACS infrastructure as the primary impacted domain. Following the Competitive potential strategy on the other hand, is more effective when the hospital board views PACS as a catalyst (i.e. leading technology) in changing hospital strategy. This fitswith the ambition to becomemore efficient on operational levelswithin the hospital enterprise and beyond, e.g. by enabling cross-enterprise document sharing for medical images between chain partners. Both the Strategy execution and Service level strategies are based on functional integration, meaning that PACS can either be 'leading' or 'following' within the maturing process. The Strategy execution strategy is applicable if the hospital wants achieve operational alignment of the PACS infrastructure meeting the demands of hospital board as a strategy formulator. As a consequence hospital strategy is the main driver for optimizing organizational processes and associated PACS infrastructural choices. The Service level strategy (triangle construct) is more appropriate in realizing strategic alignment when PACSis primarily deployed to meet (end)user demands and needs and support key areas of the hospital operations. This implies that new PACS technology is acquired in order to fulfil operational requirements in the hospital. For instance, if radiologistswant long-term archived CT-studies to be retrieved within seconds, this yields that a new data storage solutions, configuration and infrastructure are required.

[TABLE 1]

In practice, hospitals will define their own roadmap evolutionary, revolutionary or both as a hybrid strategy. Based on the above considerations each strategic roadmap defines improvement projects that can be executed according to the triangle construct within the Strategic Alignment Model. Both the alignment and fit approach that build the model imply that multi-disciplinary teams are formed consisting of physicians, technicians and engineers, to deliver (tactical and operational level) the agreed objectives [47]. Consecutively, actions and results should be monitored using project management methods. Basically, evolving towards a higher level of PACS maturity includes critically reflecting on the chosen path while maintaining continuous alignment between the business and IS/IT domains.

DISCUSSION AND CONCLUSION

Achieving optimal usage of PACS in hospitals seems a long, complex and poorly examined process. Thus, a method for hospitals that enables the strategic planning of PACS is very valuable. In this paper we propose a strategic planning method towards PACS deployment, based on the application of the strategic alignment concept, and the maturity growth path concept on the PACS domain. This extends the current PMM [PMM; 24] and defines strategic planning from an integrated and situational perspective. The framework and method provides a practical application for decision- makers for setting goals, critically reflecting on the current PACSsystems and evolving towards higher levels of PACS maturity. Although the proposed framework currently includes five maturity levels of the PMM, this does not implicate that

strategic developments will come to a standstill after hospitals have reached the optimized PACS enterprise chain level. On the contrary—as the medical imaging field matures and expands to include imaging throughout the enterprise chain, developments and disruptive innovations continue to emerge. Examples are the application of serial advanced technology attachment, data grid architecture development, cloud computing, scalable distributed server environment and service oriented architecture [48]. Considerable challenges in terms of integration, co-operation and collaboration are at stake for hospital enterprises in the development towards shared diagnostic data repositories on regional and national levels, containing longitudinal patient records with diagnostic images and reports [49]. One needs to take into account that hospital boards tend to define their strategy, growth paths and roadmaps based on their short and long-term needs. As a consequence, hospitals are driven in daily practice by external, market-driven and non-market-driven factors, leading to emerging and sometimes opportunistic strategic planning. In retrospect, the maturation of PACS might than be classified of evolutionary or revolutionary nature. In our view, applying the concept of strategic planning is valuable to any hospital that is willing to (re-)evaluate their PACS investments and the overall system performance. Through the use of the proposed framework, strategic planning by alignment is more likely to be achieved in practice. Stage-based theories are often criticized for being oversimplistic with regard to the assumed set of consistent (i.e. sequential) stages [41,50]. In this case, we extended the PMM by bringing in strategic alignment and situational growth paths. We demonstrate that both levels of maturity and growth paths are interrelated, avoiding the linearity pitfall of most stage-based models. To the best of our knowledge, this paper is the first in applying the concept of strategic planning for PACS maturity. It outlines what in principle is needed to evolve through the different maturity levels and what the considerations are at each level. It contributes to an integral alignment model for PACS technology by further specifying PMM with strategic planning methods. Despite its attractiveness our developed framework has several limitations. Obviously, applying our strategic planning method to a number of hospital cases is needed to validate it and to allow for critical reflection. Furthermore, a specific validation opportunity concerns the application of certain growth paths and strategic perspectives and how this is related to clinical performance within the hospital. What also is not addressed in this paper, is how hospitals can truly align PACS on a given maturity level and how to account for optimal diffusion within the organization. A suggested method may be validation by expert sessions, for instance. These matters are currently under investigation. We expect that our method can likewise be used to describe and reconstruct any hospital PACS case. In this paper, we argued that the framework is situational. It provides four different routes to achieve business/IT-alignment that are dependent on the strategic direction of the hospital. Next, the two ‘operational’ routes, expressed as both evolutionistic and revolutionary growth paths, are also to be aligned with the context of hospital strategies [46]. To conclude, we expect that the inclusion of both strategic alignment and maturity growth path concepts make strategic planning PACS planning in hospitals rigorous. The framework developed is therefore designed for further empirical research and clinical practice application.

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[TABLES AND FIGURES]

Fig. 1 The strategic alignment perspectives [35]

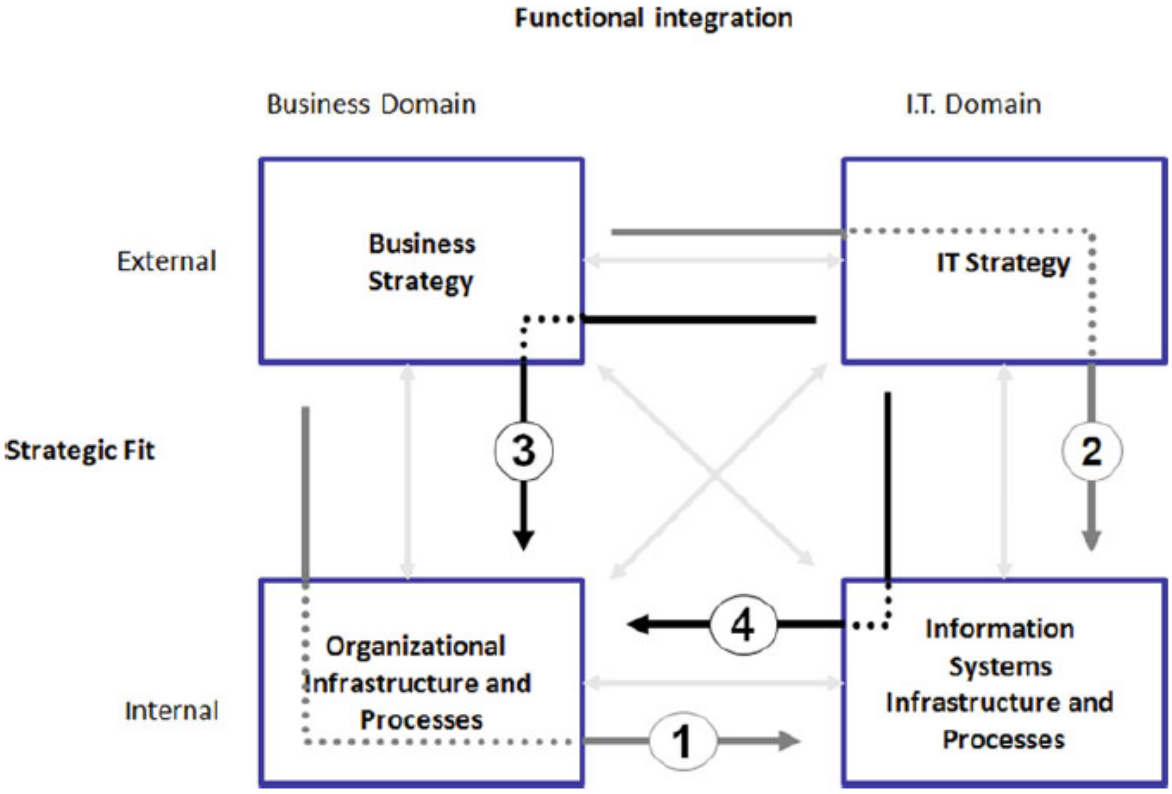

Fig. 2 Situational growth paths for PACS maturity, adopted from [24]

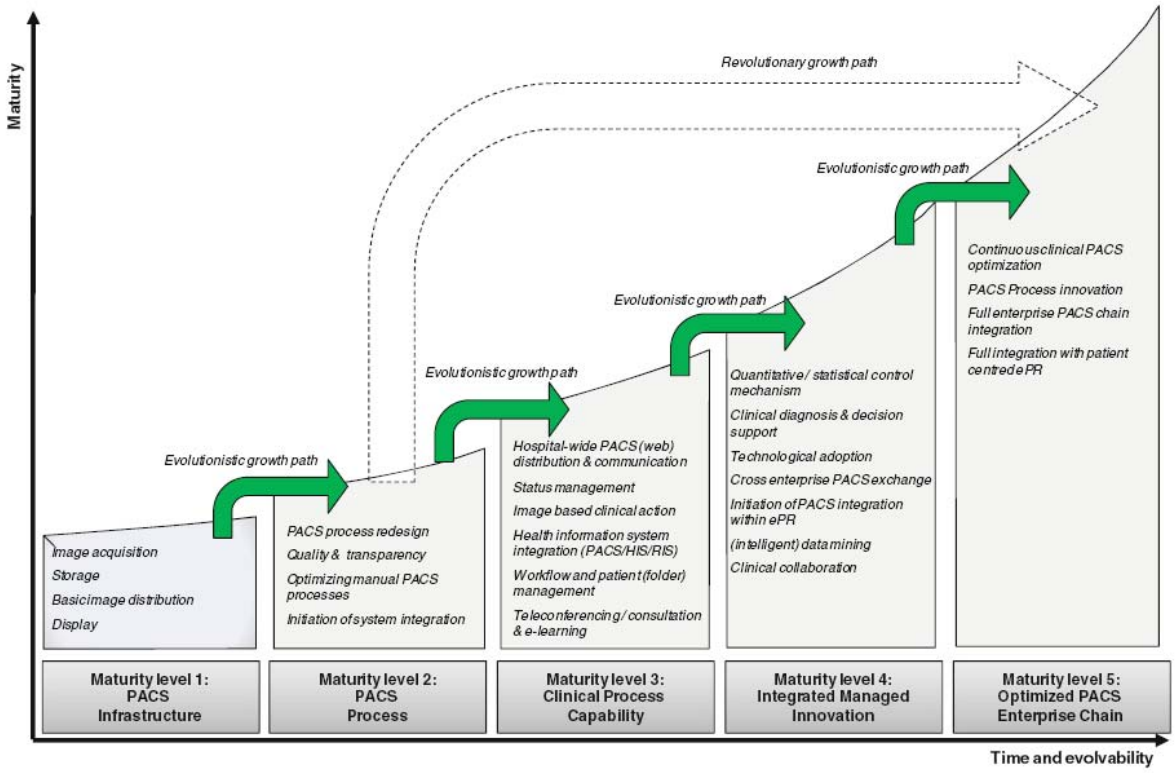

Table 1 Eight strategic planning methods for PACS maturity

Growth paths		
Strategic perspectives	(A) Evolutionistic	(B) Revolutionary
1. **Strategy execution perspective**: *In this perspective the hospital strategy is the main driver for organizational processes and PACS infrastructural choices*	**Evolutionistic strategic planning focus**: *Dealing with incremental process improvement using PACS technology* PACS is seen as operational IS/IT in support of improvements in the hospital infrastructure. The main orientation in this perspective is on integration and operational alignment of the PACS infrastructure meeting the demands of hospital organization	**Revolutionary strategic planning focus**: *Becoming a lean and mean hospital utilizing PACS for process innovation* The hospital board is the strategy formulator, while PACS implements that strategy in order to improve hospital infrastructure and processes. Processes are redesigned and extended beyond radiology and the hospital enterprise requiring new PACS infrastructure capabilities. This usually results in changes to the PACS architecture
2. **Technology potential**: *This perspective focuses on how PACS technology can be included into the IT strategy and subsequently the IT infrastructure and processes*	**Evolutionistic strategic planning focus**: *Extending current vision on optimal usage of PACS technology within the hospital* Driven by hospital strategy, this method focuses on the added value of PACS aiming at a reliable PACS infrastructure as the impacted domain. Imperative is stepwise integration of PACS and other medical IS/IT	**Revolutionary strategic planning focus**: *Revising current vision in terms of scale and functionality of PACS* The PACS infrastructure is based on a top management technology vision on doing hospital operations. PACS competencies might come from (outside the usually chosen paths and focus on adapting new technologies (e.g. image post-processing programs)
3. **Competitive potential**: *This perspective has a focus on turning PACS technology into leading technology that can directly drive and enable new hospital strategies*	**Evolutionistic strategic planning focus**: *Creating awareness and consolidating PACS as a catalyst in changing the hospital* The hospital board views PACS as a catalyst in changing hospital strategy. Within the evolutionistic growth path, focus is on hospital business deciding which PACS technologies and developments to implement on an operational level to support clinical processes and come competitive with PACS operations	**Revolutionary strategic planning focus**: *Changing strategy and operations using new technologies and developments* This focus concedes PACS to change the hospital strategy, i.e. to become the best-in-class PACS hospital. A revolutionary method enables new strategic directions focusing on expansion, new services (to other hospitals) and becoming more distinctive/competitive in terms of agile PACS and digital radiology operations
4. **Service Level**: *The perspective focuses on how to achieve a new IT strategy for PACS improvements that can optimize in organizational processes as patient care, quality, and new services*	**Evolutionistic strategic planning focus**: *Optimizing current PACS services to meet (end)user demands and needs* From the evolutionistic perspective hospitals PACS is matured to meet (end)user demands and use technological advancements. The role of PACS is to support key areas of the hospital operations and balance short-term objectives with long-term investments. This is primarily achieved through building upon existing SLAs with PACS vendors to improve current service levels	**Revolutionary strategic planning focus**: *Adopting new PACS technology to fulfil requirements in hospital operations* By including PACS within the hospital IT strategy, it aims to change the PACS infrastructure and processes to be organized accordingly. This implies optimal fulfilment (e.g. everything on-line, imaging data always and everywhere available, simultaneous availability of old images, instant image retrieval). Hospitals go beyond current vendor contracts to achieve objectives and PACS strategy

Note that the proposed planning strategies are situational applicable and that there are considerable variations of the entries possible