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Abstract

Aligning information systems (IS) to businesses has recently become a top-level concern in organizations. Several activities can be undertaken to deal with strategic alignment: elaboration of key indicators, target definition, monitoring, analysis, impact propagation etc. Working on strategic alignment, or correspondence between business and IS, requires to represent and document these two elements. Indeed, documenting strategy is necessary to evaluate the IS ability to satisfy the fundamental requirements of organizations. Different works have demonstrated that evaluating, documenting and analyzing IS alignment calls for modeling the elements to align. In the context of strategic alignment, the problem is that there are very few modeling techniques available to document organizations' strategic objectives with the level of formality needed to achieve this task. Within these few, even fewer are compatible with the ones used to define IS functionalities. This paper explores the usability of a goal modeling technique, already used in IS engineering, to model organization's strategy and to facilitate strategic alignment analysis. An application example is given, based on the well-known Seven Eleven Japan case study.

1. Introduction

Alignment between Information System (IS) and organization's strategy has been considered since several years as a top priority by CIOs and IT executives [1], [2], [3], [4], [5]. According to [6], one crucial problem to demonstrate strategic alignment lies in the fact that those who define the organization's strategy (i.e. enterprise executives), do not speak the same language as IS engineers and do not have the same vision of the organization. In fine, the consequence is that the IS does not provide the expected value to the organization.

A number of well-known techniques, such as balanced scorecards [7], analyze whether organization's strategy is achieved by using various performance measures, essentially financial ones. These approaches that come from Strategic/ Performance management help expressing the value (mostly economic) that can be expected from a business. They are most often used for business planning and to support decision-making processes consistently with organization's strategies. These approaches do not formalize the organization's strategy in a way that enables structured analysis and systematic documentation of strategic alignment.

Our experience in a multinational bank corporation showed us that an engineering method with semi-formal description is necessary to document and reason about IS alignment [8]. This view is also supported by organization architecture approaches [9] as well as by IS Chief Information Officers [10] who recommend to use semi-formal modeling to document organization's strategy and consider the IS in its organizational context.

This paper is attempting to propose a way to describe organizations' strategic objectives in the context of strategic alignment with the IS that is deployed to help meeting those objectives. Our proposal is to experiment the use of the map formalism to design the organizations' strategies in the context of strategic alignment. We use the case study of Seven Eleven Japan, which has been well reported in the literature, to validate our experimentation.

The paper is organized as follows: section 2 explains the fundamental issues explored in the experiment. Section 3 presents the experimented approach, section 4 describes our modeling technique for organization's strategy, that is illustrated in section 5. Follow-up research is presented in the concluding section.

2. Related works

The rest of the paper uses Forgang's definition to deal with the concept of strategy: "a firm's competitive strategy [..] is defined by the particular mix of price, product features and quality, and service that distinguishes its goods or services from those of rivals" [11]. This definition meets Porter's definition [12] and focuses on two particular elements of the strategy: (i) the organization's distinctive advantages and (ii) the strength gained by advantages relatively to those enjoyed by competitors. This definition excludes concerns with no direct influence on the IS, such as shares management and the accounting policy of organizations.

2.1. Alignment

Depending on authors, different kinds of items are involved in strategic alignment.

Henderson's and Venkatraman's Strategic Alignment Model (SAM) [13] distinguishes four areas (i.e. business strategy, IT strategy, organizational infrastructure and processes, information infrastructure and processes) along two dimensions (called "strategic fit" and "functional integration") that together constitute the overall strategy of an organization. SAM proposes four approaches to establish alignment depending on whether the business strategy or the IT strategy is considered as a guiding force, or not. It inspired numerous models [14], [15], [16].

Some works (e.g. [14], [15]) study alignment between organization's strategy and IT strategy, but they do not provide a method to model strategy. Other works focus on alignment of software architecture and business process architecture (e.g. [17], [18]), or on alignment between systems and business processes (e.g. [19], [20], [21], [22], [23], [24]). In these approaches, alignment involves mainly the organization's strategy, business processes and/or systems, but it is not a concept per se.

The issue of representing and measuring alignment has been tackled, but not at a strategic level (e.g. [25], [19], [20], [8]).

2.2. Organizational strategy in management

In management, approaches like balanced scorecards and value chains have been defined to express business strategy as quantifiable goals and to monitor the organization's performance in terms of achieving these goals. The balanced scorecards were proposed as the basis for a strategic management system [7]. The principle is to express the organization's strategic objectives under the form of a coherent set of performance measures distributed in four perspectives: financial, customer, business process, learning and growth [7]. While top level objectives may be expressed in terms of growth and profitability, lower level objectives are defined in more concrete terms as they progress down the organization. Each manager at the next lower level develops objectives and measures that support the higher level objectives.

These approaches rely on performance measures and values but they seldom represent strategy. Our experience on different projects shows that without any representation of a concept, it is difficult to reason on it.

2.3. Goal-oriented approaches

In IS Engineering, different approaches have been developed to express high level IS requirements. For example, goal modeling techniques allow defining the purpose of the system for different stakeholders, in particular its future users.

The goal modeling approaches are very diverse and they can be used in different contexts. Some of the well-known methods are i* [26], CREWS L'Ecritoire [27], KAOS [28], MAP [29]. The i* model [26] adopts an agent-oriented approach to model IS requirements. The dependencies between the actors allow to emphasize the link between requirements. CREWS-L'Ecritoire combines goal modeling and scenario analysis to propose a systematic approach for eliciting organizational goals based on linguistic rules [27]. In KAOS [28], the link between high level goals and operational requirements is made through refinement relationships expressed through predefined levels of abstraction. Goals are operationalised with logical predicates. MAP [29] focuses on the different ways to achieve goals. Operationalisation is apparent both through the different strategies attached to goals and trough refinement.

In [30],[31],[32],[33],[34], Bleistein et al. deal with aligning the business strategy and the IT, they propose a requirements engineering approach based on i* to

represent, in the same model, (i) the organization's strategic goals and (ii) the activity and the processes through which these goals are realized. Physical context is captured in Jackson's problem frames.

S. Bleistein [30] underlines that "the literature surrounding i* and Tropos provides no cases in which i* has been used to address concerns of business strategy or organizational IT for which there is a strategic purpose". This observation could have also been made about the other approaches. Indeed, these approaches propose a step by step process to construct an IS aligned with the requirements but are not specific to alignment. Furthermore, they primarily focus on operational concerns and do not address business strategy. Admittedly, some of these approaches deal both with functional and non-functional goals, but none of them considers strategic goals as a concept per se, i.e. differently from other kinds of goals.

The following section presents our proposal to exploit the map approach to model strategic goals and document strategic alignment.

3. Experimented approach

3.1. Strategic alignment overview

In the proposed approach, strategic alignment involves the organization's strategy, the business processes, and/or the information system as shown in Figure 1.
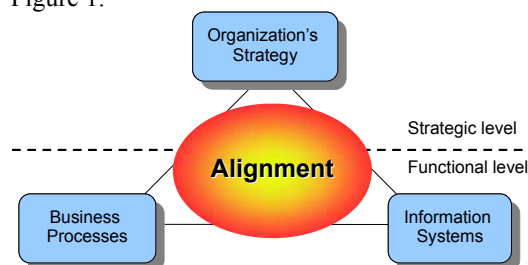

Figure 1: The alignment concept

Alignment between the business processes (BP) and the information system is dealt with by [35], [8]. This paper proposes to tackle the alignment between the strategic and the functional levels.

This change of focus from BP-IS to organization's strategy-BP/IS alignment requires to model the strategy as BP was before wise. However, this generates a number of issues: multi view of the strategy according to different perspectives in the organization, and formalization of high level visions with enough detail.

We consider that organizational strategic level contains goals and objectives that define what the

organization must achieve in order to be considered successful.

3.2. Intended context of use of the strategic alignment model

Information systems, as well as business processes, must take into account the organization's strategies and support them. At the same time, the organization's strategies must also consider limitations and capabilities of the system.

Besides, when the organization's strategy changes, the impacts on the IS must be analyzed in order to determine if it implies some changes and the other way round. Let's take the example of a bank which organization's strategy evolves towards offering differentiation by segment group like proposing different products to retail and corporate clients. The impact on the IS and on the business processes must be identified and specified. In the case of a bank, such an evolution has consequences on the organization, processes and IS. Differentiating business processes can be achieved by proposing different credits to a private customer and a corporate customer.

As shown by Etien [36], IS evolutions can impact alignment. Indeed, evolution can strengthen and weaken the links between IS and strategy.

These links can be analyzed to highlight whether the IS/process and the strategy are in harmony or not. Adaptations are necessary, and can impact the IS/BP, or the strategy, or even both. Even if alignment is strong at some moment, change will inevitably occur. Documentation of alignment can help (1) predict consequences of change (2) analyze evolution required to assure realignment, and (3) choose one proposition among several alternatives or design options.

Our approach is to document the *contribution links*, between the organization's strategy and the IS/BP. These links can be defined when a strategy is supported by one or more IS elements. The presence or the absence of a link shows an alignment or non alignment and eventually helps eliciting the requirements needed to improve alignment.

Figure 2 illustrates our view of the context in which we believe it is particularly important to get the alignment right. The arrows from the strategic alignment to the other entities express a situation where the strategic alignment is not perfect. This could mean for example, that some part of the organization's strategy cannot be supported by the system and/or by the processes. The visibility of the organization by the stakeholders is not correct and can lead to a decrease in

the organization's performance and competitiveness. It is thus important to undertake corrective actions, these are identified by arrows from strategic alignment to entities. Such corrective actions can be identified as strategic alignment is explicitly defined between the organization's strategy and IS.

c : corrective actions

e : evolution on Organization Strategy Model or/and Information System/Process Model.
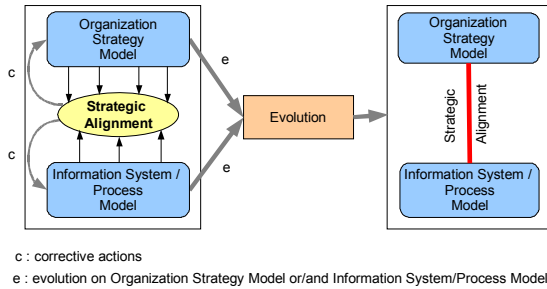
Figure 2: Description of the purpose

The rest of the figure illustrates evolution. Indeed, organizations must evolve to remain competitive. Such evolution can concern the organization's strategy (e.g. a new positioning on the market) or the business/system (e.g. to enact new laws, or use new technologies). It is determinant for the organization that any evolution is analyzed to preserve alignment or at least to link new IS elements to organization's strategy elements and vice-versa.

Difficulties with strategic alignment result, from (a) the communication issue between managers and engineers and (b) the absence of relationship between their respective worlds [6]. Indeed, whereas organization's strategy is defined in terms of goals actors and performance indicators the system is specified using concepts such as objects, events and functions.

3.3. Overview of the experimented approach

We propose to explicitly design strategic alignment by (1) goal-oriented modeling for both levels and (2) *contribution links* between the two models. Our approach uses a single modeling formalism for all goal models and thus to represent (1) the organization's strategy, (2) the business processes and (3) the system. This makes the approach independent of the formalisms used by the organization.

In this approach, as shown in Figure 3, the system, the business and the organization's strategy are designed using a unique formalism.

We chose to use the MAP formalism because it is goal oriented and contrary to i*, it obviates the combinatory explosion from large amounts of details and multiple points of view.
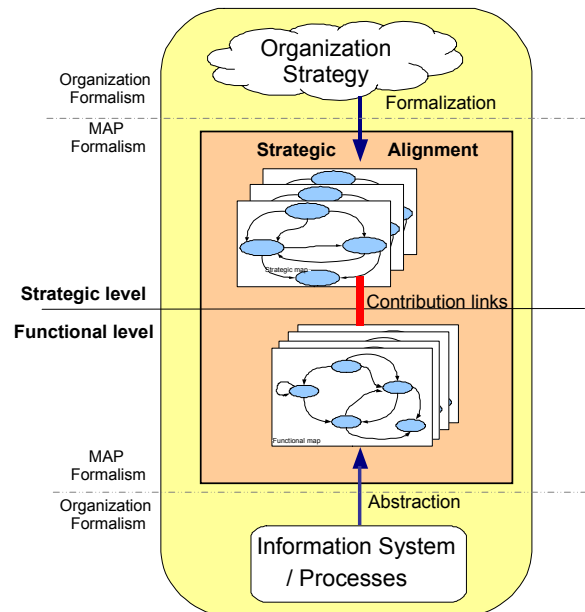

Figure 3: Overview of the approach

MAP is goal-oriented and allows a multi purpose representation. Indeed, it highlights both the goals to achieve (called intention) but also the way to achieve them (through the concept of strategy[1]). This approach allows to abstract and represent within the same model the IS and the BP. In this case, maps are "functional" in the sense that they describe the activities of the business and the system. The organization's strategy is formalized and designed with the same formalism but in a separate model.

Contribution links explicitly specified allow to link strategy with IS or business parts. Various kinds of links can help to define precisely the impact of organization's strategy changes on the IS/BP and vice-versa. They also help to identify corrective actions for example when parts of the organization's strategies are not supported by the IS. Defining of these links is out of scope of this paper but can be found in [37], [38].

4. Designing strategy with MAP

The following section formally defines MAP with meta model concepts and shows the adaptation that are needed to deal with the strategic level.

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[1] Strategy here is different from the "organization's strategy".

4.1. The MAP meta model

The MAP formalism is described in [29], [39]. A map is an oriented graph which nodes are goals (or intentions) and edges strategies, i.e. ways to achieve a goal. Maps organize goals and strategies to represent the flow of decisions made in process. A goal precedes a strategy when its achievement is a precondition to undertake the strategy. The other way round, a strategy precedes a goal when it identifies a way to achieve it.

Only one level of abstraction can be shown in a single map. By avoiding unnecessary details, maps help in focusing attention on what is to be achieved (the goals) and the ways required to achieve them (the strategies.

Refinement mechanism allows to describe a section by representing it with a goal/strategy map. Such a refinement mechanism occurs until the operational level is reached.

4.2. Strategic MAP

Figure 4 presents the strategic MAP meta model (SM^3) using UML notation. In SM^3, strategic goals correspond to M^3's goals. A section in a map is a triplet composed of a source goal, a target goal and a strategy. It represents the way to achieve the target goal from the source goal following a given strategy. The refinement mechanism allows to refine a section in a map but contrary to M^3, a strategic map can refine more than one section in SM^3.

The organizations' strategic objectives composing the organizations' strategies are documented in a business plan or similar documentations. An Or*ganization's Strategic Objective* corresponds to a set of *Strategic Goal*s attainable by different manner (named strategy in map formalism) that form a *Strategic Map*.

A strategic map expresses the long term vision statement of an actor in the organization. This vision takes into account the high level requirements of one or several external actors, such as customers and shareholders. A strategic map can be seen as the vision of an organization's actor oriented towards the satisfaction of a given external actor's needs. The needs of other external actors can appear in a map if their satisfaction is of the principal external actor's needs satisfaction process.
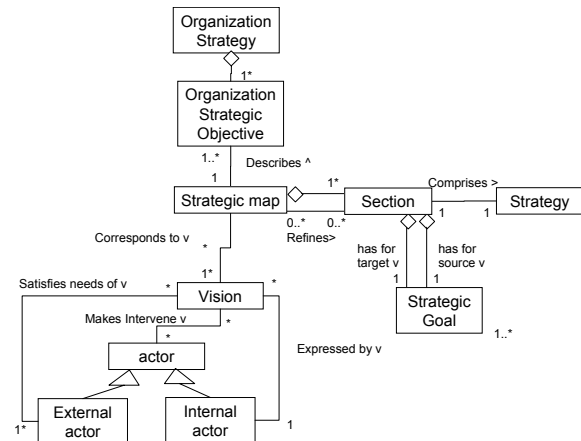

Figure 4: Strategic MAP meta model (SM^3)

Thus, there is not a unique strategic map for a given organization's objective: there are as many maps as there are of internal actor's visions expressions. For example, one strategic map can express the vision of stakeholders with regard to customers; another can express the vision of stakeholders with regard to shareholders, and a third the vision of marketing managers with regards to customers.

A strategic map can group more than one vision: multiple perspectives can be described in a single map depending on refinement and on the closeness of their goals and strategies.

A vision can be described differently in several strategic maps. It can be useful to compare maps and the various consequences of their implementation. Furthermore, as allowed in the M^3, a section can be refined by a strategic map.

5. Experiment

This section reports the experimentation of our approach with the SEJ case study, which has been well reported in the literature (e.g. [41]) including requirements engineering literature (e.g. [30]-[34]), and also used to present an approach for strategic alignment that models the SEJ strategic alignment problem ([30]-[34]).

5.1. The SEJ case study

Seven Eleven Japan (SEJ) is the largest chain in the Japanese convenience retailing industry.

The SEJ supply chain is complex and implies several partners like suppliers, distributors, logistics providers, and franchise stores.

SEJ's major asset is information rather than physical properties. Indeed, SEJ's strategy is to use information

to meet customer's demands, so that they can always find in SEJ franchised stores "what they need when they need it". Coupled with an effective delivery service, this strategy helps in increasing sales, lowering the number of unsold items, and reducing the need for storage space, which is important in Japan where space is rare.

Having the right product at the right time calls for gathering very diverse information: purchasing habits, the store's neighborhood from both social and environmental perspectives, weather, local events, etc. All these data are analyzed in real-time in order to forecast what the customer might need at the exact time they shall need it.

Main strategic objectives expressed by SEJ are as follows (see reports managements on the SEJ website: http://www.sej.co.jp/english/):

- Get better value of SEJ stores by answering to any client's needs;
- Live in harmony with the local communities;
- Respect the environment.

5.2. Modeling SEJ's strategic objectives with MAP

SEJ runs its convenience store business through joint business between Franchisees (stores) and SEJ Headquarters. SEJ is in relation with manufacturers, which provide the goods and deliver them in distribution centers, and transport companies, which deliver goods in stores. Another important external actor is of course the customer.

Figure 5 presents the SEJ strategic map which corresponds to the stakeholders' vision with a customer perspective, the strategic goal of this map is to get better value for the SEJ convenience stores.

The study of SEJ values and aspirations (visibility, availability towards customers, innovation, anticipation etc), makes emerge two main strategic goals. These are (1) *Control the resources* such as time, space, stores, products and (2) *Increase sources of value* such as customers, products quality, organization efficiency. These goals must both be achieved to: "Get better value for the SEJ convenience stores".

Reading various strategic documents seems to show that these are the two main goals that any firm might want to realize. These strategic goals are high level goals. One should notice that they do not make an explicit reference to financial performance but that, nevertheless, they are strictly connected.

As Figure 5 shows, each strategic goal is achieved through several strategies (in term of SM³ concept). For example, the strategic goal (b) *Control the resources* can be achieved through four strategies. Three of them originate from (a) *Start* (i.e. can be undertaken without pre-condition) (1) by anticipating problems, (2) By coordinating logistics of products and (3) by answering quickly to store requests.
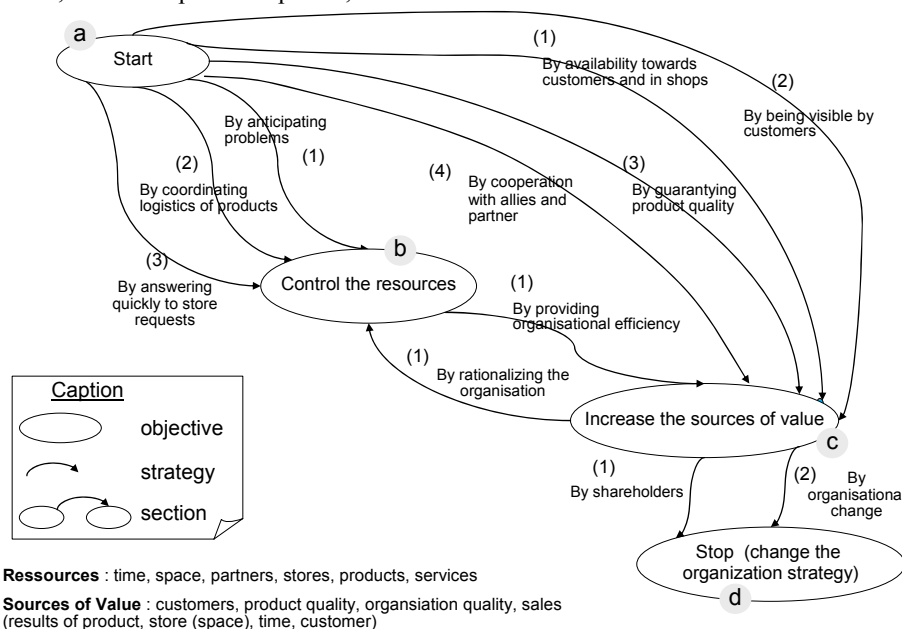

Figure 5: SEJ strategic map for the organization's objective "Get better value of SEJ stores by answering to any client's needs" from stakeholders' vision

The last one is related to (c) *Increase the sources of value*, it is (1) by rationalizing the organization.

The stop intention identifies the need to change the organization's strategy. When a mission is finished, another path in the map can be chosen or a new strategic map can be defined. Two strategies have been identified for this purpose: following shareholders demands or make organizational change to adapt compared to the internal or external factors.

As shown by SM³, actions in strategic maps can be refined into more detailed strategic maps.

Let's detail the ab2 and ac1 sections:

- Section ab2: < Start, Control the resources, By coordinating logistics of products>. The SEJ strategy relies on a "just in time" policy and optimization of storage space. For this purpose, SEJ must share information as much and as soon as possible, reduce the time of products possession, reduce the number of deliveries per store, and collaborate with its different partners (manufacturers, transport companies, etc).

- Section ac1: <Start, Increase the sources of value, By availability towards customers and in shops>. SEJ analyzes the customers' needs in order to propose the right products at the right time and to reduce lost sales opportunities. SEJ gathers large amounts of data and analyzes them according to different criteria in order to anticipate customers' needs.

If a section of a strategic map is not immediately "operationalisable" then it can be refined. For example, the section ac1 is refined into another strategic map.

To align organization's strategy and IS/BP, this latter must be documented too. Figure 6 corresponds to the high level functional map of SEJ's goal: "Organize networks of franchised stores".

This map is functional by nature. It shows how SEJ organizes its franchised stores network by achieving the goals "Define offers", "Supervise the shops", "Keep the accounting books" and "Maintain the image". SEJ can achieve these goals by specific strategies that implement its policy.

The functional goal *(b) define offers* can be achieved (1) by catalogue construction or (2) by geographical development' (e.g. store implantation, concentration policy). The functional section F_ab1 <start, define offers, by catalogue construction> corresponds to composing the products catalogue of SEJ, for example, by analyzing the trends, the clients' habits, the external factors and specifying the supply chain for each of these products. In refined maps, we could find some functionalities relating to the sales analysis hours by hours, by store, to the clients' profiles etc. Each store chooses some products from this catalogue to compose its own catalogue. Thereafter, a functional map corresponding to the view of the store responsible would contain a goal named "define store's catalogue".
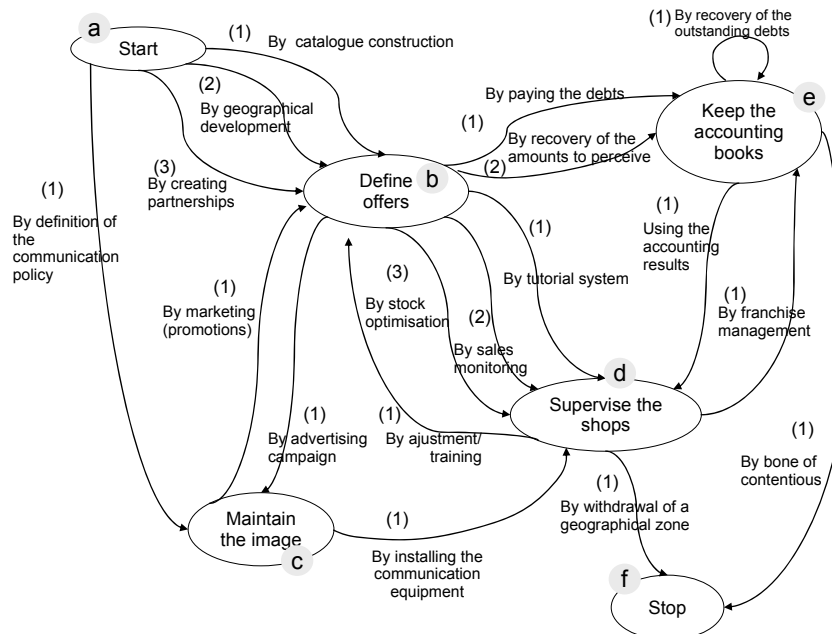

Figure 6 : Functional map: "Organize networks of franchised stores"

5.3 Discussion

This case study shows that it is possible to model strategic and functional levels by MAP formalism and to use links to analyse alignment. We found that the proposed approach is easy to use and efficient, but this should be confirmed by empirical evaluation.

We focus on this case study on high level strategic and functional levels but it is also possible to refine further onto make contribution links more precise.

The experiment shows that our approach allows working on alignment. It helps structure the conceptual decision and facilitates traceability by understanding why changes are needed and from which they result. In addition, traceability helps to analyse the impact of evolution and support decision making.

Different contribution links could be defined between the strategic and functional levels to show how and to what extent the organization's strategy is supported by the IS/BP, and vice-versa. Contribution is a complex concept that should not be confused with strict correspondence. For example, F_ab1 and F_ab2 *contribute* to ac1, but it does not mean that the functional level fully supports ac1. The two functional sections are *needed* to support ac1 but they are not necessarily *sufficient*. For example the dimension of sales monitoring or stock supply should appear and *contribute* to ac1.Either it already exists in the functional level (it corresponds to F_bd2 in Figure 6) either it is a required correction to obtain a better alignment.

The contribution links between the strategic and functional maps can help evaluate evolution consequences on strategic alignment. For example, an IS evolution could consist in updating the catalogue more often. This evolution contributes positively to section ac1 because it allows to define the catalogue and gain reactivity in putting available products quickly. However, there are negative points, since this evolution complicates logistics and catalogue management.

A downside shown by this experiment is the lack of guidance to elicit and structure organization's strategy in MAP. Besides, we think that our approach should be quantitatively evaluated according criteria such as usability, efficiency and gain of productivity.

This should be achieved with an empirical evaluation.

6. Conclusion and future works

This paper has reported the experimentation of a novel approach to document organization's strategy in the context of strategic alignment. Our initial hypothesis is based on our experience in industrial projects, which showed us that it is necessary to adopt an engineering approach in order to describe phenomena with a sufficient degree of formality.

Some limitations of the experiment can be outlined:
- We based our study solely on research documents, articles and SEJ's annual reports (no SEJ internal documents or interviews).
- Our study of the SEJ case doesn't cover the company in its entirety, and unexpected problems could arise during a complete study. Companies are also made of non rational elements that might be difficult to integrate in our method.
- No quantitative dimension is proposed, our experiment is empiric and subjective.

This paper has proposed the use of MAP formalism, to model both strategic and functional levels. MAP formalism has already been used with CADWA method to take into account decision-makers' high level requirements to design data warehouses [31]. Applying this proposal on the SEJ case study showed that contribution links could be used to analyze alignment between these levels.

Our future works concern the definitions of contribution links to analyze evolutions and to evaluate their consequences on organization's strategy and IS/BP; and also the documentation of the used process to define the strategic maps and contribution links.

We also believe that three different kinds of experiments would be useful to complete the one reported here:
1. Interviews with industrials to explore the usability of strategic maps in an industrial context.
2. Empirical evaluation of the various qualities expected from the strategy modeling language.
3. Comparative analysis of i* with the Map approach to document organization's strategy.

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