

# Assessing and Managing Intellectual Capital to Support Open Innovation Paradigm

Michele Grimaldi, Livio Cricelli, Francesco Rogo, Alessia Iannarelli

**Abstract**—The objective of this paper is to support the application of Open Innovation practices in firms and organizations by the assessment and management of Intellectual Capital. Intellectual Capital constituents are analyzed in order to verify their capability of acting as key drivers of Open Innovation processes and, therefore, of creating value.

A methodology is defined to settle a procedure which helps to select the most relevant Intellectual Capital value drivers and to provide Communities of Innovation with strategic and managerial guidelines in sustaining Open Innovation paradigm. An application of the methodology is developed within a specifically addressed project and its results are hereafter examined.

**Keywords**—Assessment; Community of Innovation; Intellectual Capital; Management; Open Innovation.

## I. INTRODUCTION

THE notion of Open Innovation (OI) has been illustrated in a well-known book, published almost a decade ago, where the author explained the limitation of the usual closed innovation processes adopted by firms to generate profit [1]. In the light of the radically changing business environment, Chesbrough suggested firms to commercialize external and internal ideas by deploying outside and inside pathways to the market [2]. From then on, the field of OI has been explored in many studies concerning the notion itself, business models, organization design and boundaries of the firms, leadership and culture, tools and technology, intellectual property, and industrial dynamics and manufacturing [3]-[5].

One of the most crucial issue of OI implementation is represented by the process of identification of the fundamental elements of each organization, necessary to support fast and strategic innovation. Different approaches to OI as for level of integration, organization and types of governance have been analyzed in literature [6]. In particular, recent business management researches have suggested that hierarchical organizations based on the command-and-control managerial mindset have to be replaced with networked, specialized, non-linear, emergent and self organizing groups [7]. The concept of strategic communities revealed to be a reliable and practical method of accelerating innovation in a firm [8]-[10].

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Many communities have originated directly from the ubiquitous access to information and ubiquitous communication or access to social networks of the Information Age, gradually progressing from individual perspectives to creative groups [11]. At present, Communities of Practice (CoPs) and Communities of Innovation (CoIs) constitute one of the major building blocks in creating, transferring, and applying organizational knowledge and are to become learning organizations, by enabling a continuous self-renewal process and by reconfiguring their flow of knowledge assets in co-evolution with competitors, customers, and suppliers. Unlike teams and groups which are conventionally task oriented and formally organized, CoPs and CoIs (these last being self-organizing groups working together towards a specific common goal) support organizational forms for innovation [12] and have shown to be successful in creating and sustaining high levels of flexibility and responsiveness [13]. Social learning theories are key to understanding these kinds of communities and the nature of their collaborative work of learning and sharing knowledge from which innovation derives almost directly [14]-[16]. In recent times, many companies have considered the competition based on knowledge and innovation as an effective strategy to be successful in the global market and have promoted knowledge management initiatives to increase the value of their performance [17].

Competences, skill, intellect, and brainpower activity, which use knowledge to create value, were first proposed as Intellectual Capital (IC) components by Galbraith [18], who affirmed that a company could create differentiated advantages by means of IC. Currently, the importance of IC has been widely acknowledged by scholars and corporations.

The purpose of this paper is to focus on assessing the IC constituents of firms in order to verify their capability of acting as key drivers of OI processes. An innovative managerial methodology which could support CoIs to assess IC and the value created through OI processes is hereafter proposed and presented. The paper is structured as follows. In Section 2 the assessment and management of the IC has been briefly reviewed and its importance as possible driver of OI has been shortly underlined as well. Section 3 elucidates the process of definition of the factors critical to the improvement of the value creation. Section 4 explains the phases of the proposed methodology. Section 5 describes an application of the methodology as implemented in an intercorporate/interfirm organizational model based on CoIs of the Italian Finmeccanica corporate (*MindSh@re*). The paper concludes with the analysis of the results obtained from the methodology.

## II. THE ASSESSMENT AND MANAGEMENT OF INTELLECTUAL CAPITAL

Since the first results of research about knowledge creation and its organization and development [19], [20] it was clear that intangibles gave fundamental contributions to the firm value chain at every level [21]-[23]. In their quality of essential value drivers, intangible assets of organizations have been characterized and intensely analysed by several articles and studies [24]-[27]. Moreover, many efforts were done in the attempt of measuring the factual components of IC in the organization performance, as, for their intrinsic nature, intangibles cannot be represented on the balance sheet [28]-[32]. The recent shifting of world's economy driven by the use of intangible resources such as knowledge, core competence and innovation has been demonstrated in its clear evidence [33],[34]. Firms need to upgrade their capabilities in response to changes of technology and to fluctuations of market. To establish and maintain competitive advantage, it is important for companies to access, share and integrate knowledge produced in diverse areas, both within and outside the company, to advance their technology by a sort of an open and uninterrupted process of innovation [35]-[38]. Orienting the process of knowledge acquisition and management to OI, a sequence of planned steps have to be developed, each giving the possibility of providing new knowledge for its ready processing and usage. In this way, the knowledge acquisition is repeatedly verified for its adherence to the value creation of organizations and for its characteristics of being a reliable key driver of OI.

### III. THE DEFINITION OF THE VALUE DRIVERS

The definition of the value drivers involves a process of identification of the factors critical to the improvement of the value creation. The identification of the key value drivers useful to provide organizations with the elements relevant to OI is strictly related to the specificity of the context, where the OI processes are implemented. On this ground, IC constituents have to be derived from the direct evaluation provided by CoI.

To this purpose, the present research makes reference to *MindSh@re*, which is an extended organizational model, based on CoIs, aimed at adding value to the existing technological knowledge within the Finmeccanica Companies. *MindSh@re* harnesses the skills and the creativity of people and acts as a disciplined innovation engine, where the CoIs focus on supporting knowledge management and innovation by designing a social system that would spark new ideas, enable critical pro-activity and overcome the limits due the perspective of companies and departments.

Determination and characterization of the main IC components have been obtained by conducting interviews and facilitated workshops, both by mail and on-line surveys, within the CoI. It is known that the outcome of an interview process gives as its first result a productive dialogue at operational level [39].

In particular, a total of 32 experienced managers and project managers of the Project Team of *MindSh@re* were asked for

their opinion about the most relevant value drivers representing the value chain of the IC. The definition of the intangible assets (IC factors) essential to CoIs, to the strategic objectives and to the value creation process have been derived. Then, the IC factors have been selected and grouped into homogenous sets, named VD, pertaining to the three kinds of IC: human, relational and structural capital (Fig. 1).

In the following, the selected VD, the IC factors defined for each VD, and the Key Performance Indexes (KPI) assigned each IC factor on the base of the evaluation of their performance are described. Most of KPIs express quantitative evaluations, but some of them can be the result of qualitative evaluations converted into quantitative values. This is the case of some IC factors from which it cannot be directly derived quantitative values. All the KPIs range from 0 to 4 points, in accordance with the following evaluation scale: 4 = excellent performance; 3 = good performance; 2 = sufficient performance; 1 = poor performance; 0 = absolutely inadequate performance.

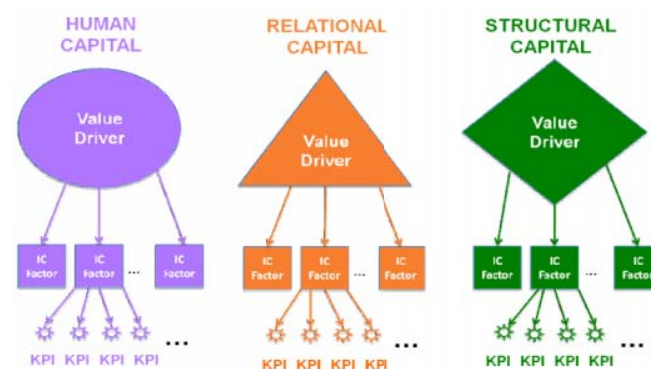


Fig. 1 Value drivers, IC factors and KPIs

#### 1) VDI: Professional Competence

In a knowledge-based society, companies can produce innovation by networking different knowledge created both inside and outside the companies and acquiring the dynamical capability of generating new knowledge [14], [40]. The utmost care must be taken in defining standards of communication and codifying practices to expedite times of creating new knowledge. Competence, capability, work flexibility, and staff formation have been recognized as main elements to gain a competitive advantage in the market. In an "open" context, therefore, it is essential to make investments not only in widening existing competences, but also in creating new roles able to sustain such a model [41], [42].

The most valuable IC factors for the *Professional Competence* have resulted in the following components (Fig. 2):

- I. Qualification and professional increase obtained by steady training courses and by procedures of know-how acquisition;
- II. Best practices codified through documents produced and distributed among all the interested people;
- III. Knowledge implemented in real project and processes following codified format.

For each IC factor, appropriate KPIs allow the measurement of the *Professional Competence* (Fig. 2).



Fig. 2 Professional Competence

2) VD 2: Leadership

Leadership of companies in the OI field has to be able to afford new tasks [43]. OI requires change in the mindset of the leaders [44], [45] and adaptations of organizations to enable efficient open innovation process [46]. The role of the leaders is crucial to encourage creativity, generation and expression of new ideas. Leaders must use dialectical thinking and power to synthesize knowledge of good quality that is unevenly distributed inside and outside the company [47], [14]. Leaders must define rules and objectives to make the teamwork solid. Several procedures allow to obtain these results: aims must be shared inside and outside the company (common purposes); recurrent meetings must be kept to strengthen people motivation; knowledge must be preserved by strengthening practice communities, while new knowledge must be shared, inside and outside the company, through innovation communities.

The most valuable IC factors for the *Leadership* have resulted in the following components (Fig. 3):

- I. vision: capability of outlining the vision clearly;
- II. positioning: leadership action in accordance with the vision to avoid contradictions and misleading team behaviour in reaching their aim;
- III. communication: capability of expressing vision through personal actions and by promoting collective activities;
- IV. confidence: ability to build up relationship between leadership and team, based on respect, assurance, reliability;
- V. attention: highly developed capability of paying attention to the outward inputs. The leader should be able to listen to the requests of his own team and to find solutions to the problems along with them;
- VI. resources improvement: leader action must promote the growth of the organization and that of the team components;
- VII. creativity: leaders must be able to stimulate the innovation creation;
- VIII. control of in-house resources: leaders must have hierarchical and relational power over internal resources of a company, in order to better develop their potentiality.

For each IC factor, an appropriate scale of evaluation allows the measurement of the *Leadership* (Fig. 3).



Fig. 3 Leadership

3) VD3: Ability to be innovative and creative

Triggering innovation processes inside companies is a task not assigned the leadership only. All the human capital of the firms is asked to improve imagination and abilities to be innovative and creative. Therefore, it is possible to define this value driver as the skill of making possible the creation of innovation by grasping new ideas and merging previous competences into new knowledge [48].

The most valuable IC factors for the *Ability to be innovative and creative* have resulted in the following components (Fig. 4):

- I. Mental flexibility: capability of making use of strategic approaches and lateral thinking in order to guess possibilities of innovation; broadmindedness toward new technology;
- II. Synergies among people: mental pro-activity as a consequence of the inclination to team work carried out in different creative contexts;
- III. Creativity: capability of generating new constructive thoughts through personal creativeness.

For each IC factor, appropriate KPIs and scale of evaluation allow the measurement of the *Ability to be innovative and creative* (Fig. 4).

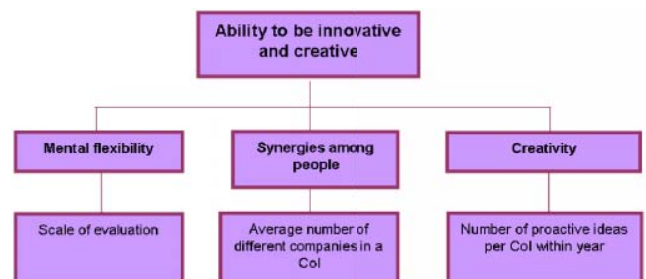


Fig. 4 Ability to be innovative and creative

4) VD4: External Networking

The totality of interconnections, collaborations and co-operations of a firm allow to increase the width of its network. Within the network, each component brings its own knowledge which is easily transformed into a shareable knowledge [49]. In the recent years, alliances and networks have been rapidly growing, especially in the technology and high-tech sectors [50], [51]. From different types of

contractual relationship usually derive the typology of the link: formal or informal. Whatever the type, external relationships help to augment information exchange and to spread company image.

The most valuable IC factors for the *External Networking* have resulted in the following components (Fig. 5):

- I. Improvement of company image to increase its value and visibility;
- II. Relations with universities, institutions, clients and suppliers;
- III. Negotiating power with suppliers, clients and competitors;
- IV. Loyalty: respect toward external relationship which generates trustworthiness of customers, sellers, etc. toward the company.

For each IC factor, appropriate KPIs and scales of evaluation allow the measurement of the *External Networking* (Fig. 5).

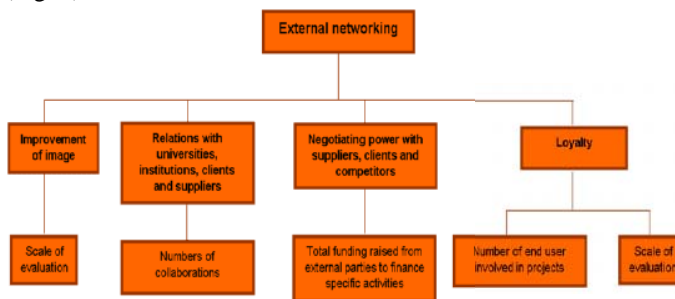


Fig. 5 External Networking

#### 5) VD5: Innovation Brokerage

Innovation brokerage activity consists in directing necessary competences toward the development of innovative solution through a broker. This last should, therefore, be able to explore, find and access the explicit knowledge inside the company. Mainly, the activity of innovation brokerage is related to filling the gaps existing among different information flows within a network also requesting external competences and knowledge [52].

The most valuable IC factors for the *Innovation Brokerage* have resulted in the following components (Fig. 6):

- I. Request for proposal;
- II. Transferability of knowledge or project ideas.

For each IC factor, appropriate scales of evaluation allow the measurement of the *Innovation brokerage* (Fig. 6).

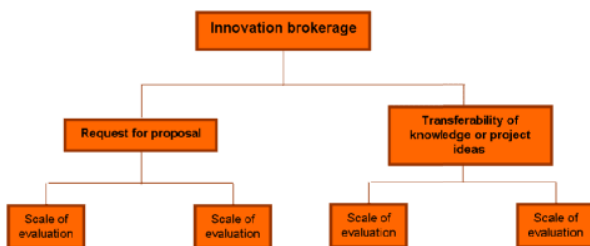


Fig. 6 Innovation Brokerage

#### 6) VD6: Tangible Assets

Activities of sharing knowledge and innovation are related both to tangible and intangible assets [53], [25]. As many authors assert, it is true that economic wealth and growth essentially depend, to date, on intangible assets and that tangible and financial assets are quickly becoming commodities; but it is also possible to state that to promote collaboration among leaders, co-operators, and external world, it is necessary that a well structured organization be available, where innovation and knowledge sharing activities could take place.

The most valuable IC factors for the *Tangible assets* have resulted in the following components (Fig. 7):

- I. Common laboratories, where the knowledge could be readily generated by community working together in close contact;
- II. Training courses organized to increase professional competences and innovative/creative skill;
- III. Databases, where potentially useful information, stored by communities, could be retrievable and shareable at any need.

For each IC factor, appropriate scales of evaluation allow the measurement of the *Tangible assets* (Fig. 7).

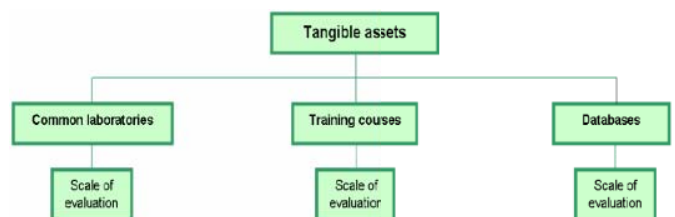


Fig. 7 Tangible Assets

#### 7) VD7: Organizational Culture

Structure of the organizations aiming at encouraging to share knowledge should be based on the valorisation of their staff and on relationships not hierarchically arranged. In this way, collaboration develops without any constraint and knowledge can flow plainly, while everybody in the community contributes to create a common team spirit [54], [55]. The establishment of an OI organization needs different mentality and qualification from the traditional ones. The resources, inside and outside the organization, should enrich the internal growth of each member of the community, enable valuable partnership, and be able to share complementary know-how. In other words, it is necessary a flexible culture, open to every kind of contamination, oriented to realize an organizational model capable to make connections and manage peer-to-peer relationships with other firms and institutions [56].

The most valuable IC factors for the *Organizational culture* have resulted in the following components (Fig. 8):

- I. Team working: aptitude to share information and competence proactively;
- II. Common team spirit;
- III. Dissemination of information.



For each IC factor, appropriate KPIs and scales of evaluation allow the measurement of the *Organizational Cultural* (Fig. 8).



Fig. 8 Organizational Culture

8) VD8: Brand Community

A brand community is a permanent group of people which share a peculiar system of values and rules, and identify themselves and the other members as belonging to that brand. The establishment of such a community is the result of a cultural approach based on the participative communication flows [57]. If properly managed, the brand community can generate guidelines to improve the internal motivation of each participant for the growth of the sense of membership, the assessment of ceremonies to celebrate the brand, the increase of cohesion among members of the brand community itself.

The most valuable IC factors for the *Brand community* have resulted in the following components (Fig. 9):

- I. Creation of a common culture;
- II. Identification with the group;
- III. Active role of each member.

For each IC factor, appropriate KPIs and scales of evaluation allow the measurement of the *Brand community* (Fig. 9).

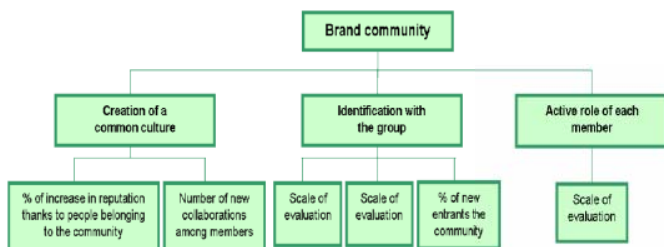


Fig. 9 Brand Community

9) VD9: Internal Knowledge Brokerage

To interact with the other firms, both inside and outside the CoI, a manager of the community should be in charge of the knowledge brokerage. Also, a member representative of each company should be present at the work meetings to act as an intermediary among the firms, looking for the solution of existing problems, and identifying innovative paths for new ideas to be combined with the existing experience [58]. Therefore, it is advisable that project teams be widely dispersed in open offices in order to take full advantage of acquisition of information [59], [60].

The most valuable IC factors for the *Internal Knowledge*

*Brokerage* have resulted in the following components (Fig. 10):

- I. Best practices transfer: that is the exchange of information and methodology innovation.
- II. Database usage: to have wide access to previously stored data it is recommended to make use of databases anywhere created within the community;
- III. Common projects.

For each IC factor, appropriate KPIs and scale of evaluation allow the measurement of the *Internal Knowledge Brokerage* (Fig. 10).

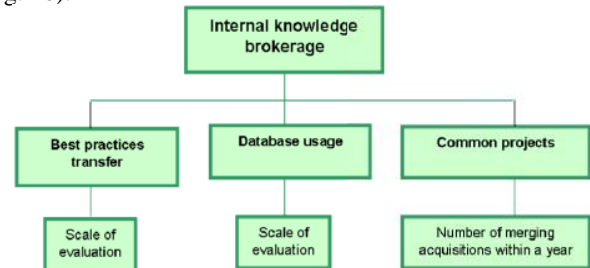


Fig. 10 Internal Knowledge Brokerage

IV. THE METHODOLOGY

The proposed methodology combines qualitative and quantitative approaches and leads progressively to the assessment of the most significant IC elements, which contribute to the value creation process through the paradigm of OI.

Three phases characterize the methodology:

1. the assessment of the Impact (I) of each VD, of the influence and Cross Impact (CI) among the VDs, and of the Performance (P) of each VD;
2. the synthesis between the I and P for every VD;
3. the synthesis between the CI and P for every VD.

A. The assessment of the Impact, Cross Impact and Performance

In the first phase of the methodology, once the hierarchical structure of VD, the IC factors and KPIs have been defined, Impact, Cross Impact, and Performance are assessed by means of three questionnaires filled in by members of the project team. The Impact of a VD represents the relative strength (or importance) of a VD respect to the value creation process. The Cross Impact of a VD corresponds to the assessment of the interrelationships among the different elements of the IC. The Performance of each VD is evaluated with regard to its current amount of qualitative stock by assessing quantitative appraisal of each VD.

As for the Impact, the members of the project team are asked to assess the efficiency of the characteristics and the relative importance of each of the *n* IC factors to achieve the strategic objective. Specifically, a value - from 1 to 5 - is associated with each IC factor belonging to each VD by measuring its influence on the achievement of company strategic goals (Fig. 11, left). Then, the Impact of every VD is

obtained by combining the values of IC factors belonging to each VD with the relative Impacts of the influencing IC factors (values in the row). Values of the Impact are grouped into three levels: *low, medium, and high*.

As for the Cross Impact, every single VD is evaluated according to its influence on all the other VDs. Each interviewed member of the project team is asked to indicate the number of relationships existing among the VDs (Fig. 11, center). In this analysis, both direct and indirect influences are taken into account; for indirect influence is intended the case of a VD affecting the behavior of another VD through a third VD, acting as an intermediary. Direct influences are represented by the sign ↗, while the indirect ones by the sign ↖ (Fig. 11, center).

Broadly, the findings of the Cross Impact assessment consist in the quantification of the knowledge flows exchanged among the IC factors that compose a VD. Thus, the Cross Impact is represented by the sum of the relationships (values in the row).

As for the Performance, the interviewed members of the project team expresses his/her qualitative evaluation by assigning each VD a value from 1 to 9. Then, the results are grouped in “levels of performance”: *none, weak, medium, strong, excellent*. Fig. 11 (right) illustrates the table used to combine the evaluations obtained from the questionnaires of the members of the project team.

			IMPACT				CROSS IMPACT									PERFORMANCE			
			IC Factor 1	IC Factor 2	IC Factor 3	IC Factor 4	VD 1	VD 2	VD 3	VD 4	VD 5	VD 6	VD 7	VD 8	VD 9	CROSS IMPACT	INTERVIEW 1	INTERVIEW 2	INTERVIEW n
VD1	Human Capital	Professional Competence					↗												
VD2		Leadership						↗											
VD3		Ability to be innovative and creative							↗										
VD4	Relational Capital	External networking								↗									
VD5		Innovation brokerage									↗								
VD6	Organizational Capital	Tangible assets									↗								
VD7		Organizational culture										↗							
VD8		Brand community											↗						
VD9		Internal knowledge brokerage												↗					

IC Factor value scale:  
 1,2 = weak  
 3 = medium  
 4,5 = strong

Levels of Impact:  
 low, medium, high

Cross Impact:

↗ : Direct influence (value = 2)  
 ↖ : Indirect influence (value = 1)

Cross Impact scale: Sum of relationships

Interview Performance value scale: 1...9

Levels of Performance:  
 none, weak, medium, strong, excellent

Fig. 11 The assessment of Impact, Cross Impact and Performance

**B. The synthesis between Impact and Performance**

In the second phase of the methodology, the synthesis between Impact and Performance for each VD is represented in a matrix as depicted in Fig. 12. Each VD is positioned within this matrix, according to its Impact (abscissa axis) and Performance (ordinate axis) values, thus giving the graphic representation of the amount of stock for each VD. The matrix consists of four cells where the VDs can be placed:

- **Strengths:** are those VDs with high influence on final result and at the same time high performance; CoI intends that these VDs are the true strength elements which should be maintained and stabilized;
- **Weaknesses:** are those VDs with low impact on strategic objectives, and low performance; it is, therefore, necessary to carry out their analysis to make their strength grow and to understand the reasons of their low impact;
- **Opportunities:** are those VDs with low performance but with high potentiality of impact on strategic objectives; CoI considers that these VDs have good chances of growth;
- **Threats:** are those VDs with low impact on final value creation and high level of performance; this is evidence of an over-investment of resources on these VDs, implying the necessity of some actions to correct the situation or re-allocate the efforts.

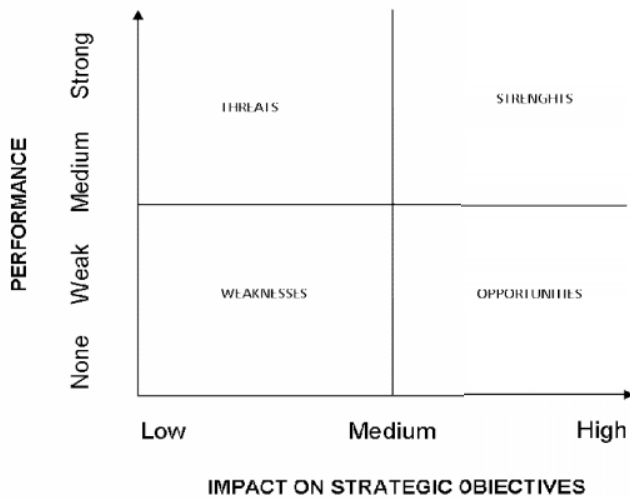


Fig. 12 The synthesis between Impact and Performance

**C. The synthesis between Cross Impact and Performance**

In the third phase of the methodology, the synthesis between Cross Impact and Performance for each VD is represented in a matrix, as depicted in Fig. 13. By comparing these two categories, it is possible to understand the critical and influential VDs.

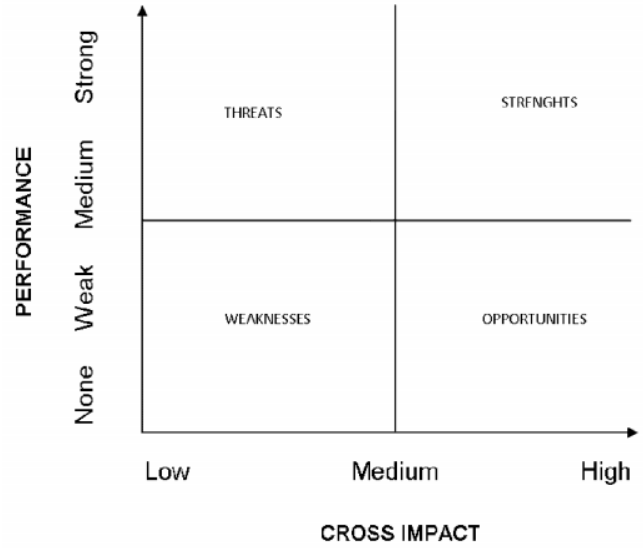


Fig. 13 The synthesis between Cross Impact and Performance

Each VD is positioned within this matrix, according to its Cross Impact (abscissa axis) and Performance (ordinate axis) values. The matched values allow to understand which VD needs investments, before going on with strategic actions. From the matrix it is possible to derive the graphic expression of the amount of knowledge flow for each VD. Similarly to the Impact-Performance matrix, the analysis of the position of every VD within the Cross Impact-Performance matrix can lead to the adoption of strategic/corrective measures.

**V. AN APPLICATION OF THE METHODOLOGY**

A project team made up of 98 experts, selected among managers, technicians and consultants from Finmeccanica and MindSh@re, has been constituted to implement the three phases of the proposed methodology. It is worth pointing out that the sample of people interviewed during these phases differ qualitatively and quantitatively from the sample of people interviewed for the VD definition, in dependence of their different positions within the CoI. Their task has been that of assessing Impact, Cross Impact and Performance of the IC elements on the strategic objectives related to OI.

**A. The assessment of the Impact**

According to what previously seen in the proposed methodology, the analysis of the results of the interviews which highlighted MindSh@re resources allowed to assess the three dimensions defined as Impact, Cross Impact and Performance. Here below, the Impact of each value driver on the strategic objectives is evaluated (Fig. 14).

ID	Value Driver	Impact on Strategic objectives
VD1	Professional Competence	Medium
VD2	Leadership	Medium/high
VD3	Ability to be innovative and creative	Medium
VD4	External networking	Low/medium
VD5	Innovation brokerage	Medium
VD6	Tangible assets	High
VD7	Organizational Culture	Medium
VD8	Brand community	Medium/high
VD9	Internal knowledge brokerage	Medium

Fig. 14 The values of Impact

As it is illustrated in Fig. 14, *Tangible assets* (VD6) has been considered to be the most impacting element on MindSh@re. In fact, the CoIs have showed to strongly believe in the possibility of sharing common facilities and laboratories, which allowed the generation of knowledge by working in close contact, and supported easy integration and continuous exchange of different technologies, as more widely specified in the previous paragraph. They also have judged both the *Leadership* (VD2) and the *Brand community* (VD8) to be relevant, as the medium-high degree impact on strategic objectives demonstrates. This follows from the fact that these VDs have been considered to be fundamentally responsible for increasing the group cohesiveness in learning and sharing knowledge processes. Moreover, the CoIs have assigned VD1, VD3, VD5, VD7 and VD9 a medium degree impact on the strategic objectives in terms of effectiveness, showing a problematical evaluation of abilities which still need to be deeply assimilated within CoI themselves. Finally, the low-medium evaluation that CoI assigned the *External networking* (VD4) reveals a lack of trust in the innovation produced through external relationships, suggesting the necessity of persuasive and driving actions to improve the evaluation of this VD.

#### B. The assessment of the Cross Impact

From the cross correlation of the assessment of the Impact of each VD the following results were obtained as synthesized in the last column (Fig. 15).

Among all the VDs, the utmost relevance has been attributed to the *Leadership* (VD2). This result is due to the direct, high impact of VD2 on the other value drivers for its capability of enlightening the abilities of participants in MindSh@re and of enhancing all the other resources, by triggering exchanges and relationships.

	VD1	VD2	VD3	VD4	VD5	VD6	VD7	VD8	VD9	Tot
VD1	█	↗	↗	↗	↗		↗		↗	8
VD2	↗	█	↗	↗	↗	↗	↗	↗	↗	15
VD3	↗		█					↗		2
VD4	↗	↗		█	↗	↗			↗	7
VD5	↗		↗	↗	█		↗	↗	↗	9
VD6	↗		↗	↗	↗	█	↗	↗	↗	9
VD7	↗	↗		↗	↗	↗	█	↗	↗	8
VD8		↗		↗	↗	↗	↗	█	↗	9
VD9	↗	↗	↗	↗	↗	↗	↗	↗	█	10

Fig. 15 The values of Cross Impact

Further, the analysis of Fig. 15 has put into evidence that the high value of *Internal knowledge brokerage* (VD9) is mostly gained in an indirect way, in consequence of the favourable opinion obtained by the most of other VDs as for the capability of promoting, creating, and exchanging knowledge. The other 6 VDs (values ranging from 7 to 9) seem to be strongly influenced by technological tools for communication, information, and knowledge sharing, in consequence of their propulsive effect on the interactions inward and outward the community. On this purpose, a consideration must be made as for these almost high values: high Cross Impact values, even though Impact values were low or medium, can be often consequence of the indirect interrelations among VDs. This is the case of the *Ability to be innovative and creative* (VD3). In fact, it has gained an “indirect” CI value which expresses that, in CoI’s opinion, the organization capabilities to create values through innovation are based only on the leadership and on the brand community. And this strengthens the fact that MindSh@re trusts more in the joint and organized creativity than in the individual ingeniousness.

#### C. The assessment of the Performance

Finally, the assessment of the Performance of each VD respect to all the other VDs has been evaluated by the CoI (Fig. 16).



ID	Value drivers	Performance
VD1	Professional Competence	Strong
VD2	Leadership	Medium/strong
VD3	Ability to be innovative and creative	Weak/medium
VD4	External networking	Medium
VD5	Innovation brokerage	Medium/strong
VD6	Tangible assets	Medium/strong
VD7	Organizational Culture	Strong
VD8	Brand community	Medium/strong
VD9	Internal knowledge brokerage	Strong

Fig. 16 The values of Performance

From the analysis of Fig. 16, it has been possible to assume that they have considered the performance of all VDs to be almost adequate. The synthesis of the answers of the members of the project team has demonstrated that they have appreciated the high efforts in the activities of advisory, publications, corporate projects, collaborations and requests for proposals; nevertheless, they have expressed their disapproval towards the poor propensity of CoIs for the introduction of new careers.

In particular, *Professional competence* (VD1), *Organizational culture* (VD7) and *Internal knowledge brokerage* (VD9) have obtained a high level of performance, showing that the knowledge, distributed among individuals, community and brokers, has been supposed to be qualitatively appropriate. This is also supported by the evaluations of the performance of *External networking* (VD4) and *Innovation brokerage* (VD5), showing that the investment of the community in laboratories, training courses, database customization, increase of sense of membership within the community has been considered to be successful. For the sake of completeness, it must be pointed out that the consistency of the levels of the performance is slightly reduced by the low level of the *Ability to be innovative and creative* (VD3). This result gives evidence of still persisting individual qualms about the removal of every hindrance to express new ideas and to seize any opportunity of generating innovation.

#### D. The syntheses between Impact and Performance and between Cross Impact and Performance

In this paragraph, information about Impact and Cross Impact dimensions, gathered from the previous steps, have been plotted against the Performance dimension, in order to provide the community management with a synthesis of the strategic guidelines to be implemented. Analyzing the I/P case, we can observe that four VDs are positioned in the sector of the “strengths”: *Professional competence* (VD1), *Leadership* (VD2) and *Brand community* (VD8) represent the performance of the intangible assets of the community, while *Tangible assets* (VD6) that of the physical assets (Fig. 17).

They all are indicative of the fact that relevant resources for the value creation process have been allocated on what is considered crucial to reach the OI strategic objectives. Further, four VDs lay in the sector of the “threats”: *External*

*networking* (VD4), *Innovation brokerage* (VD5), *Organizational culture* (VD7), and *Internal knowledge brokerage* (VD9). It is clearly evident that the performance of all these four VDs, although two of them are positioned beyond the average, is not successful enough in giving a significant strategic impact on the value creation process. This accounts for the fact that the valorisation and exchange of knowledge within the community should need an improvement of investment. Finally, the *Ability to be innovative and creative* (VD3), despite its medium level Impact, shows a very low Performance, signifying that it demands for a greater attention to contribute to the innovation within the community.

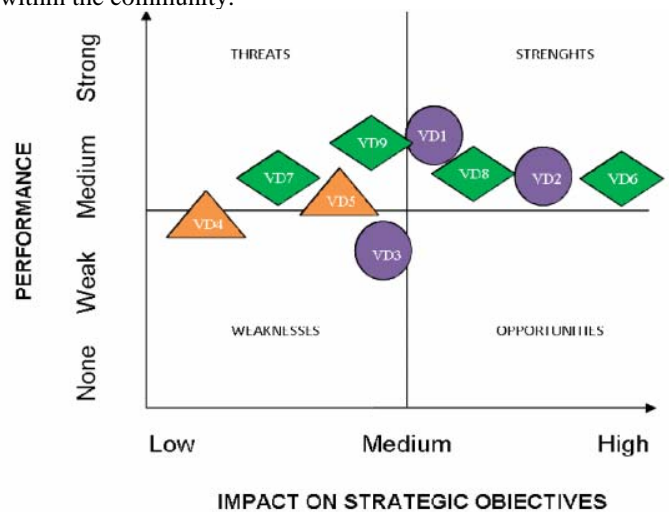


Fig. 17 The results of the synthesis between Impact and Performance

Advancing with the analysis of CI/P, it is possible to observe that the most of the VDs is positioned in the sector of “strengths” (Fig. 18), meaning that knowledge flows within the community are relevant and that a good equilibrium characterizes their relationship between Cross Impact and Performance. Under these conditions, no improvement seems to be required. By contrast, the *Ability to be innovative and creative* (VD3) is positioned in the “weaknesses” sector, its performance being the lowest among all the other VDs. Such a result, as previously observed for the same VD in the analysis of I/P appears to be strictly related to the inadequate measures adopted to implement innovation strategies within the community.

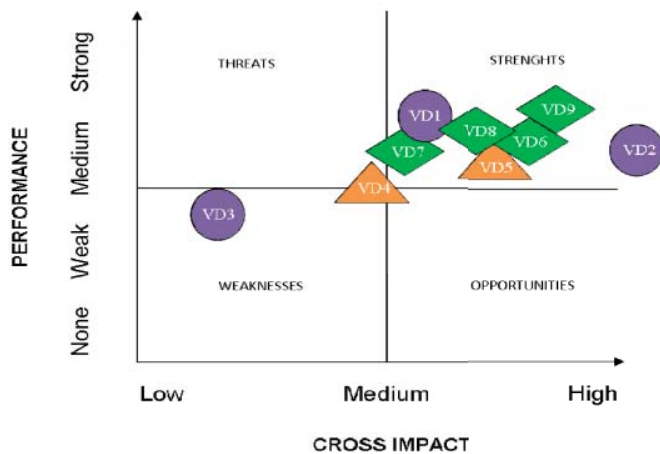


Fig. 18 The results of the synthesis between Cross Impact and Performance

## VI. CONCLUSION

In this work, a methodology aimed at sustaining the value creation through Open Innovation initiatives is proposed. The methodology is based on the analysis of the intellectual capital, which represents, in the opinion of the authors, one of the most relevant driver of the Open Innovation. Some dimensions of the essential elements of the intellectual capital, such as the performance, the impact and the cross impact, have been defined and properly combined.

The proposed methodology has been applied in an organizational context, named MindSh@re, represented by the community of innovation constituted within the Italian Group Finmeccanica.

The case study has allowed to point out that the methodology has been able to meet management's needs as for the implementation of a system able to handle and evaluate the creation of the value process, by endowing them with significant and strategic directions.

By assembling the information obtained from the graphic elements represented in this paper, it is possible to draw some conclusions about the results of the assessment of the community of innovation and about the strategic actions to implement for future improvement of the value creation process at community level.

First, three VDs, *Leadership* (VD2), *Tangible assets* (VD6), and *Brand community* (VD8), with their high levels of Performance, Impact and Cross Impact, have demonstrated to be real strength points for the community, proving to be able to act as a pulling lever for the improvement of the value creation process and the reinforcement of all the other VDs.

Secondly, *Professional competence* (VD1) and *Organizational culture* (VD7) have obtained a medium/strong level of Performance, but a low/medium level of Impact and Cross Impact, meaning that they received a sort of over-investment. Consequently, actions are needed to correct the situation by re-allocating efforts. Thirdly, *Ability to be innovative and creative* (VD3) and *External networking* (VD4) have been characterized by a low level of Performance and medium-low levels of Impact and Cross Impact, giving

suggestion for their improvement. Indeed, as for these VD, interviews have outlined that reluctance and bias restrain people from expressing creativity and inventive ability plainly. Some actions or behaviours able to give more space to the improvement of these drivers would be necessary.

Finally, the low-medium value assigned *External networking* (VD4) has elicited that doubts have arisen within the community about possibilities of innovation through external relationships. Given that VD4 is one of the most strategic value driver to sustain open innovation, significant initiative to improve external networking operations have been strongly advised.

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