Towards Holistic Enterprise Modelling: Value Creation Concept in Fractal Enterprise Model (FEM)

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Abstract: Some researchers argue that traditional applications of enterprise modelling (EM) may provide limited value when performing holistic analysis due to disjoint modelling domains that comprise organizations. Fractal Enterprise Modelling (FEM) is a promising EM approach addressing this issue. FEM uses a modelling technic that articulates an organisational fractal structure of an enterprise, and has been used for representing different practical challenges in organisations. This paper is a part of an ongoing research where FEM is used for a holistic analysis of organizational change associated with a strategy implementation in an organization. Particularly, the paper discusses the application of a previously emerged modelling pattern that was useful for supporting operational decision making. In this paper, it is argued that the same pattern is also useful for representation of a value chain concept that allows to connect a high organisational level to the elements of a lower operational level. The results imply that the usage of this pattern might be beneficial to promote systematic and holistic modelling for business analysis using FEM.

1 INTRODUCTION

Enterprise Models (EM) are frameworks for organising and classifying the principle factors relevant to the purpose (Fettke, 2009) e.g. describing and understanding how an enterprise works, and for process improvement, etc. (Albertsen et al., 2010; Bernhard & Recker, 2012; Blanc-Serrier et al., 2018; Davies et al., 2004; Krogstie, 2015; Land et al., 2009; Leonard & McAdam, 2002; Loucopoulos et al., 2015; Parikh & Joshi, 2005; Weick, 1989). However, some researchers argue that due to disjoint modelling domains comprising organizations, the traditional application of EM provides limited value (Krogstie, 2015; Olhager et al., 2001; Stirna & Persson, 2007). Fractal Enterprise Modelling (FEM) (Bider et al., 2017) is a technic that articulates organisational fractal structure proposed by (Hoverstadt, 2013) and that may be a promising solution for joining different domains. The fractal organisational structure sets down a well-tested systematic approach for building a enterprise model of an organisation using the recurring patterns at the progressively smaller scale and of any degree of complexity.

FEM consists of the three types of elements representing processes, assets and relationships between them. These elements build two main types of artefacts (or fractals): Process-Asset and Asset-Process. Using these fractals in a reccuring manner allows to build a directed graph. There is already published a number of works about the main principles of building FEM, see for example (Bider et.al, 2017; Bider et al, 2018; Bider et al. 2019) or visit a website (www.fractalmodel.org.). Initially, FEM was developed with the ambition to address a challenge of identifying existing processes in an organisation, in-cluding hidden (Bider, Perjons, 2018). However, it was also tested in the case studies for suitability in a variety of business tasks (Bider, 2020; Bider et al., 2017; Bider & Perjons, n.d.; Bider & Perjons, 2019; Klyukina et al., 2021) with promising results. For example, when FEM was used in operational decision making, useful process modelling pattern was identified. Particularly, the acquire-asset-stock pattern was used for breaking down generic processes into smaller activities to obtain more details. Although this pattern is similar to process modelling, there are some distinctive differences, see (Klyukina et al., 2022). Another example of using FEM is for identification of so called “value capture processes” that tackles multiple domains such as resource management and building of competitive advantage; this was enabled by the

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analysis of the recurring patterns of asset-process and process-asset archetypes (see (Klyukina, 2021)). Hence, the idea of using the same enterprise modelling technique for complex business analysis when several domains intersect, seems worthy to investigate further.

The presented paper is a contentious research dedicated to describing how different modelling patterns in FEM may represent multiple business domains, e.g. acquire-asset-stock relationship has reinforced its usage as a value chain model of [24] in the case of change analysis. Thus, the purpose of this paper is to describe the extended role of acquire-asset-stock pattern in FEM analysis and demonstrate it on the real case exampple.

2 RESEARCH APPROACH

The presented paper is a part of a broader research related to the FEM development in both perspectives: as a conceptual modelling and as a toolkit. Thus, the research approach belongs to Design Science (DS) paradigm and is concerned with building artefact (Hevner et al., 2004) or finding a solution (Bider et al., 2013). The presented research falls into the demonstration phase in definition of (Peffers et al., 2007). The preceded case studies including FEM application for operational decision making (Klyukina et al., 2021) resulted in eliciting a practical issue. This issue is associated with the limited possibility to use one enterprise modelling technique for holistic business analysis. The effort to address this challenge represents a move towards the solution.

Fernandez argues that the synergy between rigor and relevance within DS is possible on the basis of a case analysis that provides a good framework for rigorous and relevant research of emerging phenomena (Fernandez et al., 2002). In the presented research, the relevance part is addressed through contextual, practical application of FEM where a holistic analysis of an organisational change is required. Since to find out the missing knowledge and fil the gap in a new area of design it is useful to attempt carrying out the design using existing knowledge (Vaishnavi & Kuechler, 2008), the rigor part is addressed by explaining how the emerged solutions are related to an accepted theoretical framework. Particularly, Porter's value chain framework (Porter, 1998b). This concept has been chosen since it is a well-excepted and widely used existing framework.

To reach the aim of the study, the suitable context for testing FEM as a holistic modelling tool was identified as the case of organisational change. The organisational change is always a complex matter affecting few or several business domains (depending on the scope and type). The project started in October 2021. The data is being collected through the semi-structured interviews with the manager of the investigated department as well as the study of documents. The overall purpose of the modelling project is to assist top management with change analysis for strategy implementation. The whole work was designed by specifying certain purposes and corresponding steps. This paper describes results only on the first step of the entire project with the purposes:

- to create FEM models of the organisation at a high strategic level to illustrate the generic process of the value proposition in the context of the overall goal and the chosen strategy;
- to show the position of the change in the business context by decomposing the main value proposition process into sequential value creating processes and;
- to depict how the change elements contributes into the value creation through interconnections to the other elements at a high level of the system creating the possibility for further decomposition.

The knowledge acquired in the project, either positive or negative, contributes into FEM development since it provides the information on the future research directions. The result would be considered as a success if the modelling experience delivers on at least one of the following outcomes:

- building a FEM model at a high level capturing organisational value proposition, goal and strategy;
- building a valid FEM model of a generic value creation showing the position of the change elements and interconnections to other elements at a high level with the possibility to further decompose the processes. In the presented outcome, 'valid' is defined as depicting organisational value creation context corresponding to Value Chain concept of (Porter, 1998b).

3 VALUE CREATION CONCEPT IN FEM

Porter's Value Chain is an iconic model that depicts general organisational processes (Fig. 1). The model comprises five main processes (bottom line) representing the chain of processes that creates and accumulate value to the end product; and four support processes (horizontal lines) that represent the internal

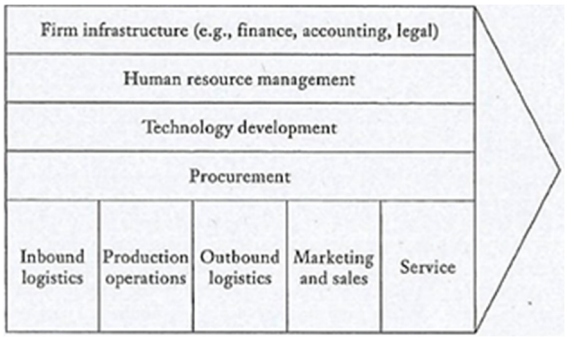

Figure 1: Porter's Value Chain model (Grant, 2013).

activities needed for main processes to run smoothly. However, Porter's model is criticised for the lack of dynamics (Grant, 2016). In FEM Porter's Value Chain concept can be realised using acquire-asset-stock pattern (or process decomposition) (Fig. 2).

Fig. 2 is an illustrative example that shows the decomposition of the main value process or value proposition of the company 'Production and selling of goods'. The five processes that this value proposition consists of represent the value chain corresponding to Porter's generic model. To decompose the main process, the acquire-asset-stock pattern is used in the way as described in (Klyukina et al., 2022) to show how the goods are transformed from the raw material to the sold and delivered followed by offers for services. This pattern usage is similar to process modelling where more details can be added (in this example all unnecessary details are omitted to keep it simple). The process-asset archetype is used to denote the instrumental assets needed to perform value creating processes. In Fig. 3, these are shown in relation to the two processes in the value chain: 'Inbound logistics' and 'Marketing and Sale'. For instance, Infra-structure is represented by different 'Corporate services' such as IT, financial, legal, etc., or H&R is represented by the 'Human resources' asset with the notation 'Work-force', etc. These assets represent the contribution of the support processes into the main value creating processes corresponding to Porter's HR Management, Procurement, R&D/Development and Infrastructure. The need for these assets justifies the existence and the design of the support processes. Note, when Value Chain is applied to FEM, the support to main activities is represented not by the activities themselves but by the assets that are required to run the main processes. In other words, the sup-port activities are represented by the processes needed to tune the 'instrumental' as-sets. Such representation

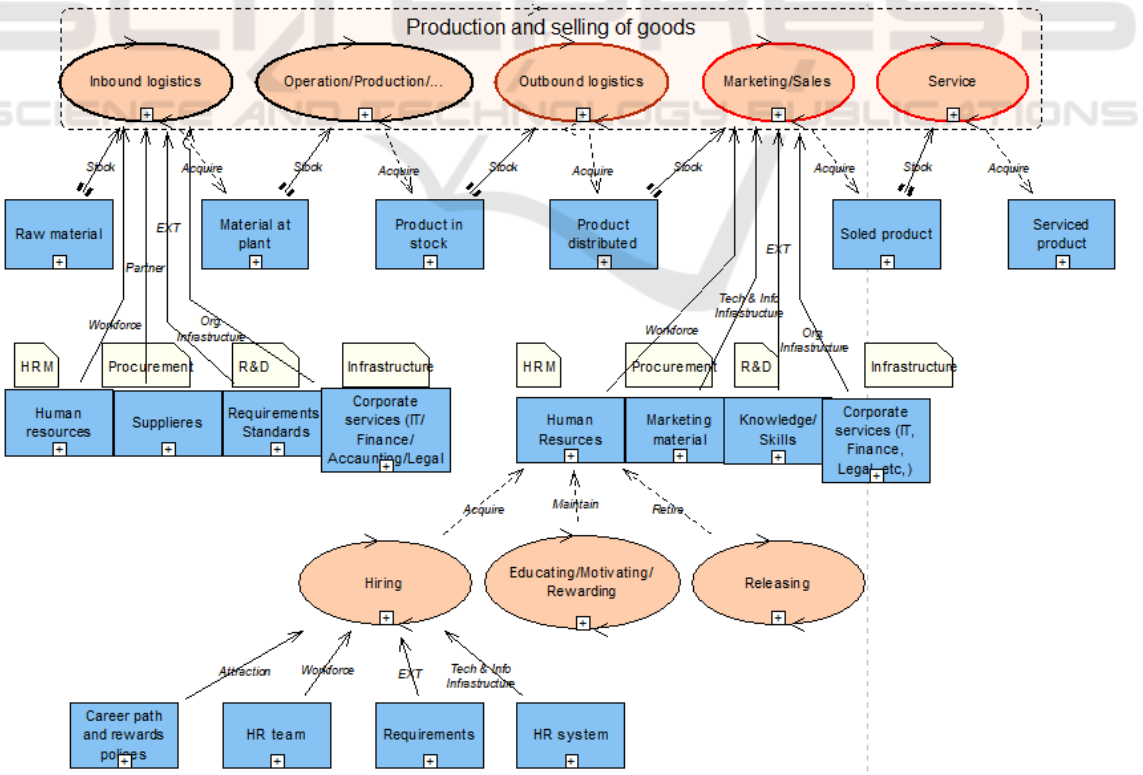

Figure 2: Value Chain concept in FEM (hypothetical example).

addresses the dynamics issue since change in business entails changes in assets that affect internal/external transactions, use of skills and resources that may have a repercussion effect on finances if not adjusted (Lecocq et al., 2006). Thus, this way of value chain representation contributes not only to identification of what support activities must be in place but also to what and how they should be adjusted in relation to change. This identification is necessary for a holistic analysis. For example, as it is shown in Fig. 2, to hire a certain type of workers the "Career path and rewards polices" plays an important role as an attraction of the desired people in the "Hiring" process. Other links can be further investigated by repetition of the process-asset/asset-process archetypes or process decomposition into smaller activities. Being able to model such interconnection implies on the high potential usefulness of FEM to assist change analysis and strategy implementation.

To test FEM for a holistic analysis using value chain concept as a starting point the real case example has been used.

4 BUSINESS CASE

The following description of the business case presents only partial information relevant to the present stage of the study. Future planned papers will reveal more details on the practical situation and the complete results of using FEM for strategy implementation and change management.

The organisation where FEM is applied to assist analysis of an organisational change operates in the field of Information Communication Technologies (ICT). The global corporation produces and sells test measurement equipment. However, for a number of years, the business has been challenged by the rapidly changing environment and tough competition. As a consequence, the company's position as a technological leader in the field has been compromised. To reach the goal and retain the status of being a technological leader, the top management has decided to undergo organisational change. The change concerns structural adjustments to its R&D function that is expected to produce the desired outcomes. Consequently, a new WG1-Technology department for development of a long-term, holistic product strategy has been established. The organisational structure is presented in Fig. 3.

Denoted in red (Fig. 3) in the hierarchical tree the investigated department is presented, namely, WG1 – Technology. This department is established to implement the declared strategy and win back the leading strategic position. Due to historical reason, WG1-Technology department is structurally positioned under WG1 group which is part of a Sales but, actually, is a self-standing department that reports directly to the M-Group office. It works closely with Sales and five Business Units to coordinate their activities. This new department is where the data for the case was collected. The new role is concerned with a thorough environmental analysis that aim to support a proactive product strategy development, as well as coordination of

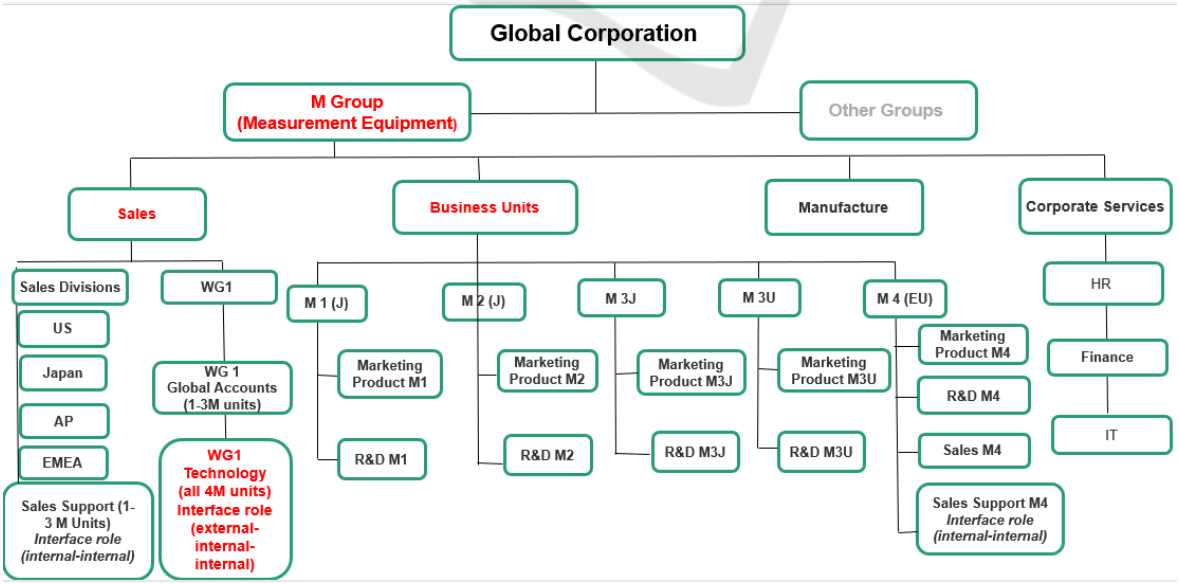

Figure 3: Business organisation (case material).

information flow between Sales and R&Ds different Business Units. The practical challenge, though, for the management in reaching the desired goal is to be able to implement and adjust the direction of the chosen strategy when needed.

To assist management in this task the modelling project has been initiated on the basis of the mutual benefits. FEM is deployed to fulfil the objectives with the focus on R&D processes.

5 MODELLING RESULTS AND ANALYSIS

The first step was to create FEM models at a high level of operation to illustrate the generic process of the value creation in the context of the overall goal and the chosen strategy, see Fig. 4.

The model in Fig. 4 illustrates the highest level of organisational operation. The asset on the right "Strong reputation associated with the superior innovative capability" and a certain growth "Profit (%)" represent the desired organisational strategic position. Namely, its prime objective is to regain a leadership in innovation in the field of measurement equipment supply; and, subsequently, to increase the profit by being up-front with the customers in the market. The standard process-asset archetype is used to represent this generic, high level goal modelling. Comparing to the goal modelling, this is a starting point to breaking down the processes into more detailed components that actually exist in the organisation. The goal modelling is focused only on breaking down the goals with relatively complicated observation of interconnections and actual activities needed to reach the goal. Whereas, FEM elements can be decomposed to a detailed level in a relatively simple manner without losing the track of the origin.

The second sub-purpose of modelling to create FEM showing the position of the change in the business context by decomposing the main value proposition process into sequential value creating processes and to depict the interconnections of the elements of change relative to its position at a high level of the system was completed by building of the model shown in Fig. 5. Note, that due to the limitations only the fragment of model is shown. The model in Fig. 5 presents the main value creating process's decomposition and maps the position of the support R&D activities and their contribution to the one of the main value creation 'Sale process' in a given context. 'Production and sell of measurement equipment'. The R&D process is highlighted by the red-coloured boarder as well as the asset it produces that is needed for value creation in the 'Sales process'. The graph also shows that the creation of the asset 'New models and modifications' requires the coordination of the activities and information flow between working groups for innovation, sales and production. These is shown by the links between processes. These elements represent the old way of working towards the goal of having a superior innovative capability.

The change elements are shown by the solid red colour: the process 'Product strategy development' which role is to acquire and maintain the 'Long-term holistic product strategy', and the workforce dedicated to the task represented by the asset "WG1-Techology advisory team'. These elements were created to reinforce the reputation and goal achievement by better coordination of the involved teams and information exchange. This is done through introduction of a new element necessary for the value creation, the long-term product strategy.

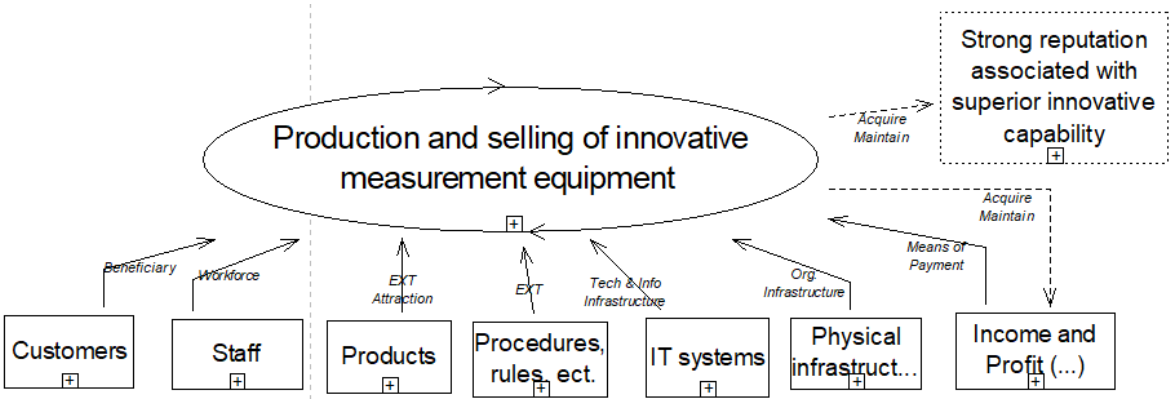

Figure 4: Highest level organisational value proposition model (case material).

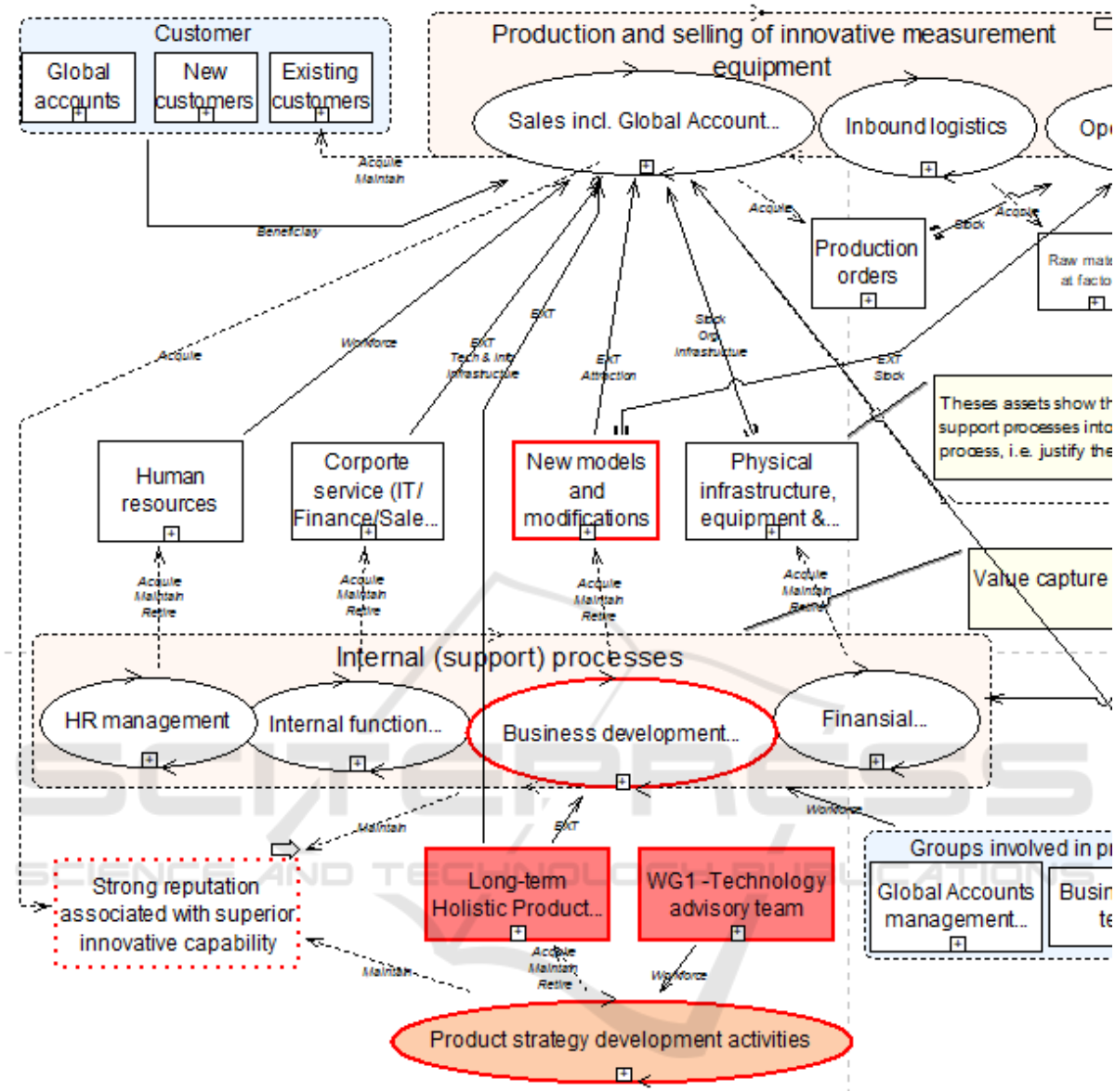

Figure 5: Decomposition of the main process into value chain (fragment from the case material).

This contribution is captured in Fig. 5 by the link with notation EXT showing that the holistic strategy for product development works as overarching instruction for all involved parties.

This decomposition represents the next level of the operational hierarchy where acquire-asset-stock modelling pattern is used. This pattern is similar to the process modelling technique of transformation input into output. Its usage and usefulness are already described in using FEM in operational-decision making (Klyukina et al., 2021).

Note that showing the difference in the work coordination before and after the change as well as how lower-level elements may affect the goal achievement is a matter of the future work. Namely, the next step would be to decompose the process-es in question (e.g., business development process in the case) into sub-processes, the subprocesses into activities and so on revealing the interconnectivity aspects. However, this paper is concerned merely with the outlining the way of using FEM for a holistic modelling and describing how the acquire-asset-stock pattern is used to enable it.

6 DISCUSSION, FUTURE RESEARCH AND LIMITATIONS

The aim of the study is to explain the role of the acquire-asset-stock pattern in FEM for a holistic modelling. The result indicates that the acquire-asset-stock pattern might be useful to initiate a holistic modelling by representing a value chain process including main and support.

In the on-going case study where FEM is used for organisational change analysis and strategy implementation, the acquire-asset-stock pattern appears to be useful for representation of the organisational value chain defining the main and the support processes. This implies on the possibility to connect the operational level of the organisation to its generic value chain or strategic level applying only FEM technique. In fact, in the on-going study, the acquire-asset-stock pattern has been applied to represent the value chain as an initial point of the case analysis. The following scaling down and decomposition of the support processes will introduce greater details to the processes showing vertical and horizontal interconnections between different do-mains. Then, the second layer of sub-process decomposition may take place, and so on. These interconnections will allow to analyse multiple aspects such as coordination, efficiency, capability building, resource management, human and cultural aspects, etc. Such structure seems being a promising way to use FEM for a holistic analysis of the organisational change and strategy implementation. Besides, intro-duction of value chain pattern at the generic level of FEM enables the distinction between the processes belonging to the value creation or value capture activities. This is important for the holistic analysis of the overall goal achievement since creating value without capturing it is fatal for the organisation's survival (Grant, 2016). More discussion on the topic will follow after completing the on-going case study. Also, more about how FEM may assist to identify value capture processes in (Klyukina, 2021).

The presented research was limited to analysis of the one case example. In the future it is desirable to continue testing the proposed way of holistic modelling using FEM in the real settings. By identifying the configuration of the assets throughout the organisation's activities it might be also feasible to analyse the system from the multiple perspectives and identify sources of internal competitive advantage (innovation) within new approach of doing business such as redesigned processes or novel organisational design.

7 CONCLUSIONS

The presented paper is a part of the ongoing research on Fractal Enterprise Model (FEM) development. It discusses the role of the acquire-asset-stock pattern in the value creating context to enable holistic analysis of the organisational change in the real settings using FEM.

The results based on the objectives of the presented paper are considered as being successful. The first outcome has been achieved by building FEM model (Fig. 4) that illustrates the generic process of the value proposition in the context of the overall goal and chosen strategy. The second outcome is reached by building FEM model (Fig. 5) that illustrating the decomposition of the main value proposition process into the sequential value creating processes representing value chain. Fig. 5 also depicts the position of the change (support R&D process) and the interconnections to other elements in value creation. The impact this support process has on the strategic goal achievement is depicted through the asset it manages that is necessary for running a value creating sale process. Further decomposition is needed to enable the analyses of alignment of this support process with the chosen strategy. But this is the objective of future work. The presented results imply on that the usage of this pattern might be beneficial to promote a systematic and holistic modelling for business analysis using FEM.

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