Influential Article Review- Annual Capital Outflow for an Institutional Investment Firm: A Flow-through Approach to Coordination of Network Support Chain Preparation and Financial Planning

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This paper examines finance. We present insights from a highly influential paper. Here are the highlights from this paper: A common side effect of cross-linked global economies is that well-positioned middle-class companies are acquired by institutional investors, which formulate unreasonable return expectations in many cases. Therefore, the resulting payouts are often not in line with business operations so that even world market leaders get into trouble or close. In this context, we consider the case of a sanitary company, which had to manage the described situation after a business takeover. In order to coordinate the annual cash outflows to the investor with intra-organizational supply chain planning and financial planning, we propose a mixed-integer non-linear programming model that is based on the flow-to-equity discounted cash flow method. The objective is to maximize the present value of equity while determining annual cash outflows to the institutional investor during his engagement. As the decisions of the investor during his engagement influence possible operations of the company after his engagement, the residual value of equity (that influences the selling price) is considered. The modeling is based on cash flow series, which result from supply chain operations and restructuring on the one hand, and from financial transactions on the other. Financing is characterized by interest rates depending on the period the credit starts, the credit period, the debt limit of the company and the current total debt. As the latter is a result of the optimization, non-linearity arises. Nevertheless, both the expected demand scenario and further randomly generated demand scenarios of the sanitary company could be solved to the optimum with the commercial optimization package GAMS 23.8/SCIP 2.1.1 within acceptable computation times, if capacity profiles are assigned to the locations to depict feasible and/or preferred capacity developments. For our overseas readers, we then present the insights from this paper in Spanish, French, Portuguese, and German.

Keywords: Company takeover, Flow-to-equity method, Annual cash outflows to the investor, Supply chain design, Capacity profiles, Mixed-integer nonlinear programming

SUMMARY

- In addition to the case study alternative scenarios were prepared in order to evaluate the stability of the solution. In particular, the consequences of considering different discounting rates, uncertain demand as well as additional sustainability requirements are analyzed. Except the subject of analysis, the test instances of the scenarios are based on the same parameters as in the case study. Moreover, the same high-performance software and hardware with the same settings were used for the computations. As a result, the computation time , the cash flows to/from the investor during his 3-year engagement , the expected annual cash outflow after his engagement determining the residual value , the present value of equity and the overall percentage of demand coverage were recorded.
- The first scenario analysis is related to the challenge of determining accurate discounting rates and the potential impact of mis specified discounting rates on optimal decisions. This is especially important due to the bottom-up beta, which is not based on the company's share prices, but on an industry average. Therefore, slight inaccuracies or uncertainties while calculating the cost of equity can be neglected in our case.
- As the capital withdrawal by the investor can easily decrease the flexibility of the SC network, and thus, make it more vulnerable to unexpected changes in the business environment, a second scenario analysis is taken to determine the effects of fluctuations in demand. Instead of the expected demand used in the case study, a uniform integer random number between the following lower and upper bounds was generated by the optimization software $d11t\in$, $d21t\in$, $d12t\in$, $d22t\in$, $d13t\in$, $d23t\in$, $t=1,\ldots,4$ within all of the following 25 test instances . The other parameters of the case study remained unchanged. Thereby, the investor faces a trade-off between cash outflows and sustainability requirements. The latter concern the reputation of the company or the quality of products. Both aspects can be relevant while negotiating the selling price of the company after the investor's engagement. Regarding the reliability of suppliers, it may be preferable to maintain previous supply relationships. For this reason, we analyze consequences of continuing cooperation with the supplier in Hemer or Hettstedt during the whole planning horizon. Additionally, we focus on the closing of the production location in Porta Westfalica, which would be optimal due to the solution at the end of the investor's engagement.

HIGHLY INFLUENTIAL ARTICLE

We used the following article as a basis of our evaluation:

Steinrücke, M., & Albrecht, W. (2016). A flow-to-equity approach to coordinate supply chain network planning and financial planning with annual cash outflows to an institutional investor. Business Research, 9(2), 297–333.

This is the link to the publisher's website:
https://link.springer.com/article/10.1007/s40685-016-0037-4

INTRODUCTION

The approach and the case study proposed in this paper are motivated by a German sanitary fittings producer that was acquired by a private equity company. The old-established manufacturer, traded as a joint-stock, was characterized by ongoing expansion and thus developed to a global leader in the market segment. After 10 years, and even though the company was still growing, the owners decided to sell it to an institutional investor. The new owner started to coordinate the whole business by appointing a holding company that claimed massive annual cash outflows from the related supply chain (SC). This led to restructuring activities including the need to cut down costs and staff. A resulting decline in sales and profits began to risk the company's continued existence. The reasons for the business problems were obvious. The

investor considered the acquisition as pure financial investment focusing only on the expected return. Existing efficient network structures including locations, capacities and business partner relations as well as the supply chain operations were disregarded, as a counterproductive decoupling of decisions could be observed in this case.

A quantitative model suitable for solving the aforementioned problem must meet the following requirements: First, it must be applicable to intra-organizational supply chain structures (Morash and Clinton 1998; Flynn et al. 2011; also referred to as company-wide SC, Longinidis and Georgiadis 2011) with centralized decisions that are controlled by an institutional investor after the company takeover. Due to the investor's multiannual engagement, both long-term adjustments of the supply chain design and resulting changes of supply chain operations must be taken into account. Therefore, discrete time modeling (Van Roy and Erlenkotter 1982) should be preferred. As the prevention of insolvency during the engagement requires liquidity compensation in each period, the modeling must combine supply chain planning and financial planning (Shapiro 2004) by taking cash flow series and financing instruments into account. In particular, a flow-to-equity (FTE) approach is applicable in our case, as it measures the cash available to be paid out to the investor after meeting reinvestment needs (Damodaran 2012). As relevant for the amounts actually returned, the underlying equity approach exclusively focuses on cash flows after effective tax payments.

The article is structured as follows: Section 2 gives a literature review of other relevant contributions revealing that the presented optimization model offers a conceptual approach to solve the mentioned problem and extends the existing research in the treated field. The mathematical formulation based on alternatively selectable capacity profiles is presented in Sect. 3. A model variant using capacity levels is depicted in Sect. 4. The case study of the aforementioned sanitary company is presented in Sects. 5 and 6. To discuss the consequences of fluctuations in demand, uncertainties in the determination of discounting rates, and the consideration of sustainability requirements, we use a scenario analysis in Sect. 7.

CONCLUSION

The aforementioned case study is a representative of an increasing economic phenomenon. In case that a solvency problem arises, which can either be caused by management failures or the general economic situation, then often institutional investors (e.g., private equity companies) take over well-established businesses for a limited period of time. Therewith, the shareholders connect return expectations, which have to be satisfied by regular payouts taken from profits. Even though there are examples where existing enterprises were closed down after the takeover, the continuation of supply chain operations should be a primary goal in accordance with political and social requests, as it guarantees ongoing returns.

To reach the aforementioned goal, a non-linear flow-to-equity discounted cash flow model for the coordination of the annual payouts to an investor during his engagement with SC planning (i.e., location liquidations and openings, capacity adjustments, sales market and supplier selection, SC operations) and financial planning is proposed in this paper. The two-phase approach additionally considers operations that would be possible by using the network structure resulting at the end of the investor's engagement. Our objective (maximization of the present value of equity) also covers the residual value of the expected perpetuity of payouts. In contrast to data-driven approaches that can be found in the literature in this field, we model relevant relationships between annual decisions by a system of interdependent constraints. In particular, these decisions comprise transactions on the capital market that are realistically influenced by the overall debt limit of the company and the current total debt within the time periods of the engagement. Due to changing market situations, duration-dependent interest rates taking into account the specific time periods the transactions start and end are considered. Resulting trade-offs between financing volume, interest payments and tax shield are captured.

It becomes obvious that the problem outlined above is challenging due to its complexity. However, our computations using high-performance software and hardware revealed that the usage of capacity profiles (which represent feasible or even desirable sequences of capacity levels, and are alternatively selectable by the network managers) leads to the fact that the case study of the German sanitary company could be solved

to optimality within seconds. The same applies to all of the test instances in our scenario analysis, which was conducted to capture fluctuations in demand, uncertainties in the determination of discounting rates as well as the consideration of sustainability requirements. By implementing one of our aforementioned solutions, it can be supposed that the business problems of the company taken over by the institutional investor could have been prevented or at least mitigated.

Further research can address the following aspects: As far as a reliable estimate is possible, growth rates of the company after the investor's engagement can be taken into account while maximizing the present value of equity within the FTE approach. With respect to the limited access to funds, alternative forms of financing can be added. For capturing international issues of network planning, effects of different exchange rates and customs duties may be included. Considerations on modeling may also focus on the subjectivity of valuation, i.e., the investor's individual decision field and targets. Finally, the coordination of annual decisions resulting from our proposed model with continuous-time short-term planning at the locations can be implemented.

APPENDIX

FIGURER 1
SUPPLY CHAIN NETWORK STRUCTURE

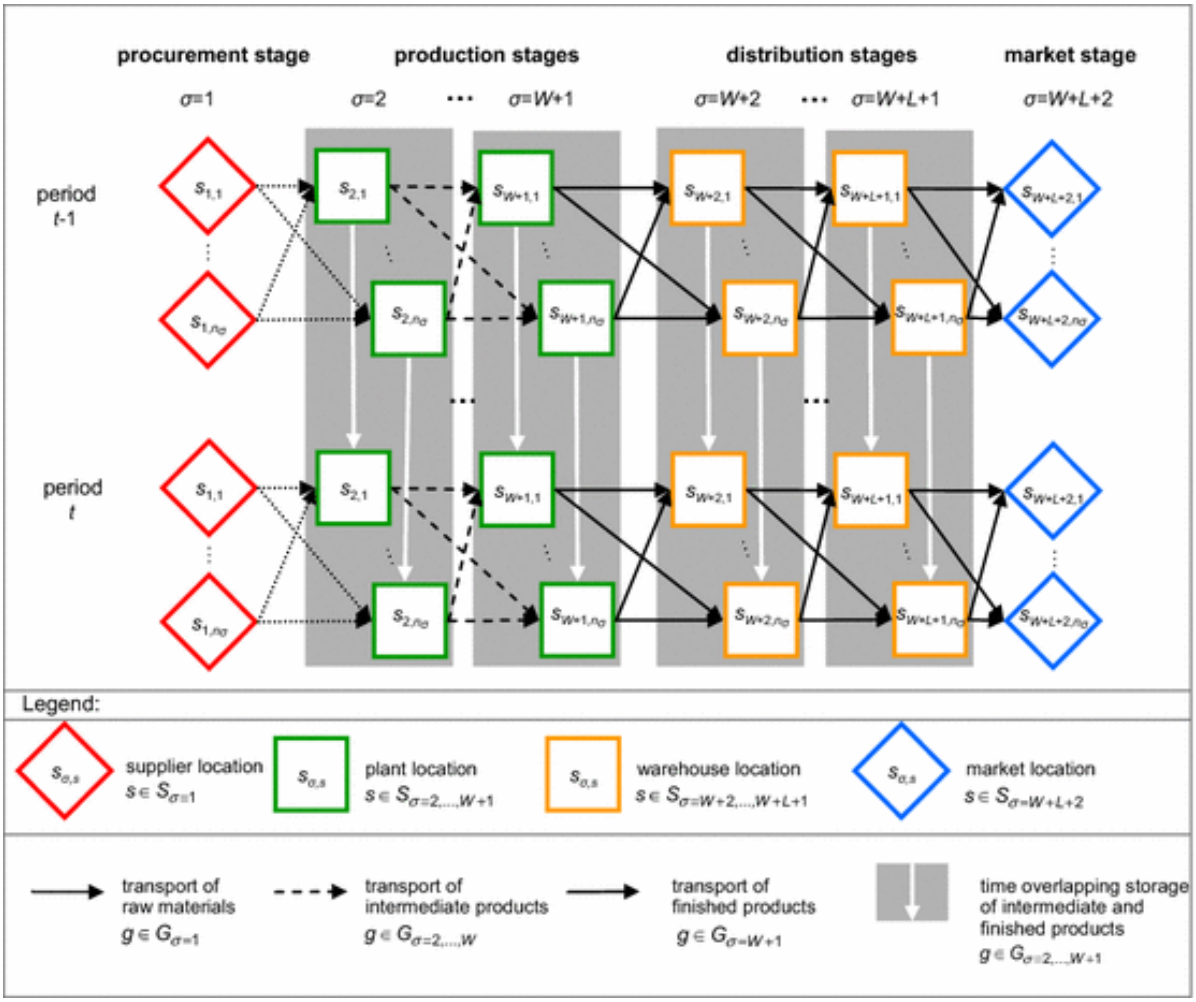

FIGURE 2
STRUCTURE OF THE DECISION MODEL

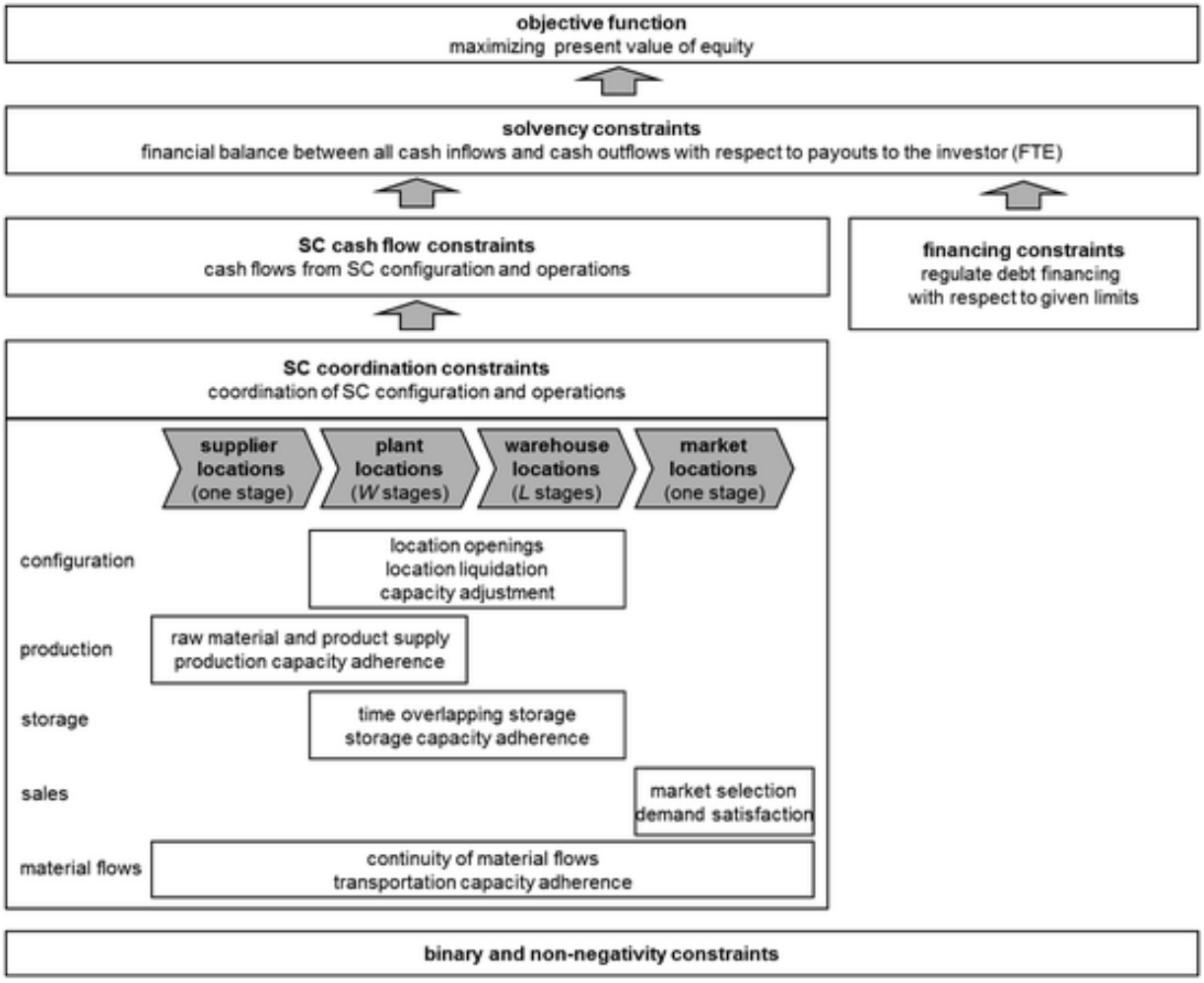

FIGURE 3
TIME REPRESENTATION

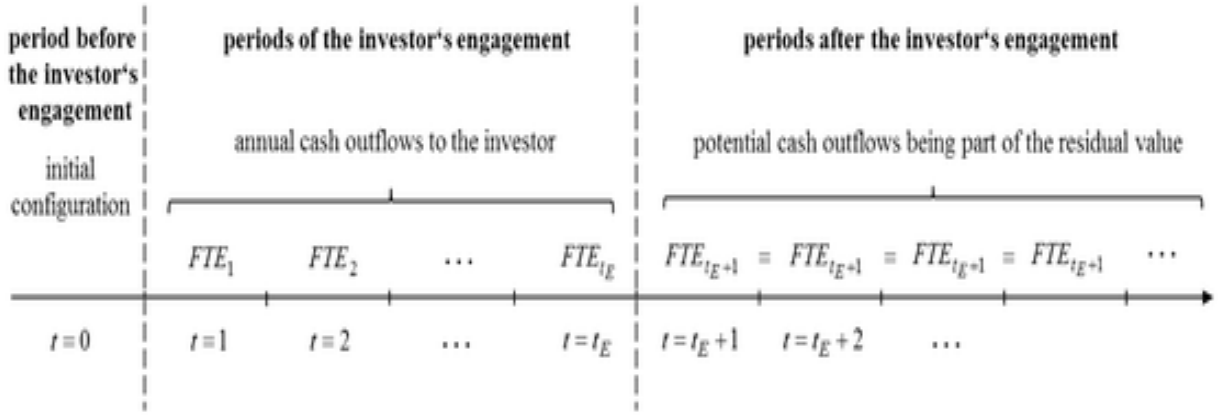

FIGURE 4
OPTIMAL SUPPLY CHAIN NETWORK STRUCTURE

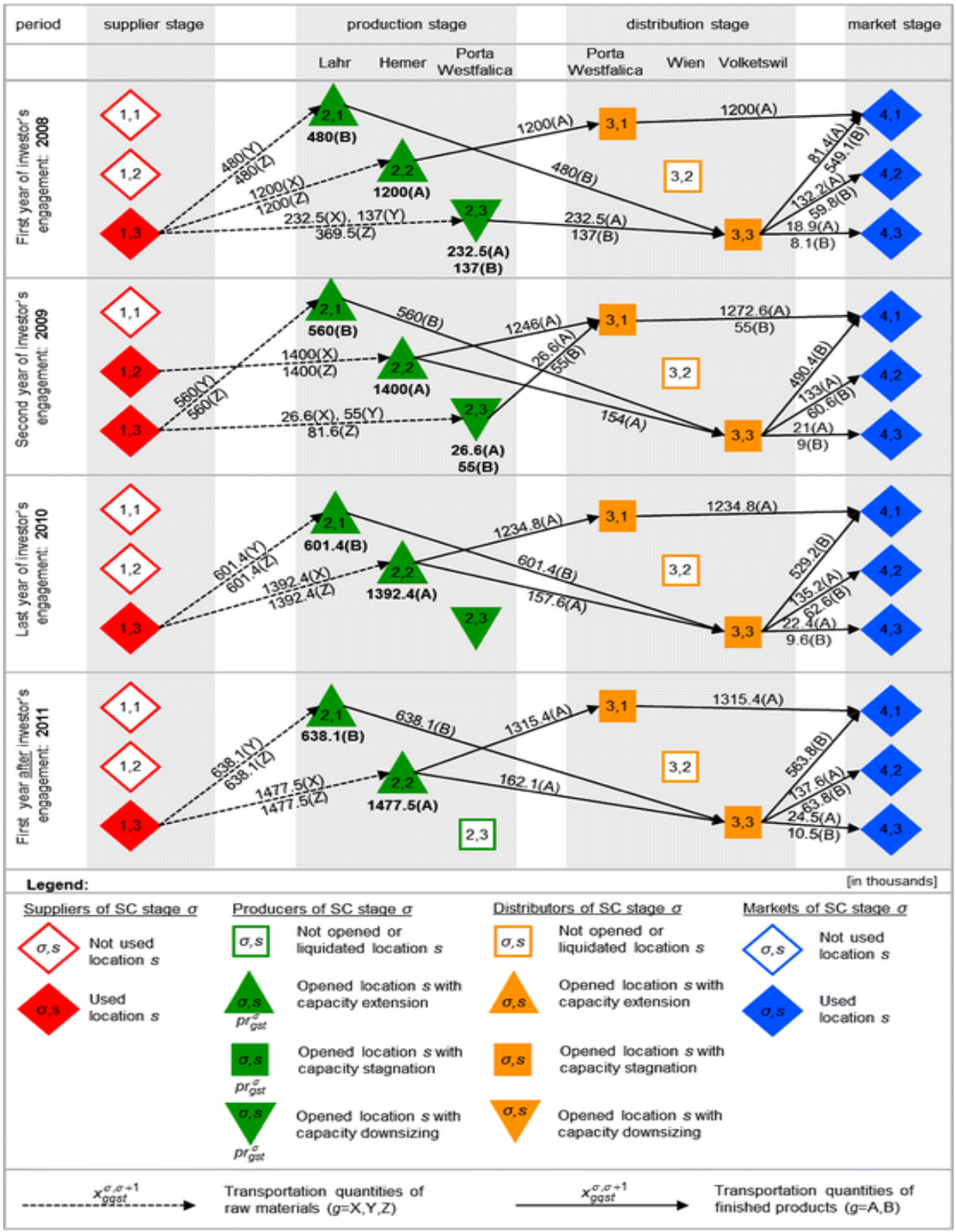

TABLE 1
CALCULATION OF FTE (IN EUR MILLION)

	Beginning of 2008	Beginning of 2009	Beginning of 2010	End of 2010	End of 2011 and following years
Operating cash flow		93.282	95.727	89.416	95.873
Interest payments for credits		−0.000	−0.058	−0.319	
Taxes (tax rate 35.2 %)		−32.835	−33.676	−31.362	−33.747
Net operating profit after taxes		**60.447**	**61.994**	**57.735**	**62.125**
Credit f12 (interest rate 6.9 % p.a.)	0.250		−0.250		
Credit f13 (interest rate 6.4 % p.a.)	0.750			−0.750	
Credit f22 (interest rate 8.7 % p.a.)		0.250	−0.250		
Credit f23 (interest rate 6.2 % p.a.)		0.750		−0.750	
Credit f33 (interest rate 9.5 % p.a.)			0.750	−0.750	
Location investments	−1.000				
Location disinvestments				2.700	
Capacity (dis-)investments	−2.175	−2.000	−2.000	−4.000	
FTE	**−2.175**	**59.447**	**60.244**	**54.185**	**62.125**

TABLE 2
SCENARIO ANALYSIS 1—DISCOUNTING RATES

No.	CT	FTE_0	FTE_1	FTE_2	FTE_3	FTE_4	VEQ	COV
R1	24	−2.175	59.447	60.244	54.185	62.125	462.737	100
R2	27	−2.175	59.447	60.244	54.185	62.125	459.164	100
R3	20	−2.175	59.447	60.244	54.185	62.125	455.644	100
R4	15	−2.175	59.447	60.244	54.185	62.125	452.177	100
R5	23	−2.175	59.447	60.244	54.185	62.125	445.397	100
R6	20	−2.175	59.447	60.244	54.185	62.125	442.082	100
R7	21	−2.175	59.447	60.244	54.185	62.125	438.815	100
R8	27	−2.175	59.447	60.244	54.185	62.125	435.595	100

TABLE 3
SCENARIO ANALYSIS 2—DEMAND FLUCTUATIONS

No.	CT	FTE_0	FTE_1	FTE_2	FTE_3	FTE_4	VEQ	COV
D1	15	−0.100	62.333	62.452	57.811	56.335	428.239	99.5
D2	33	−2.075	61.820	57.917	58.330	58.244	432.315	100
D3	19	−2.175	61.854	62.620	55.673	60.692	446.482	100
D4	24	−2.175	61.725	61.220	58.244	62.589	456.654	100
D5	23	−2.175	62.123	60.717	60.513	59.535	442.691	100
D6	43	−2.100	61.730	65.381	52.324	57.140	428.307	100
D7	26	−2.175	61.536	63.277	55.565	58.972	437.924	100
D8	15	−2.175	61.406	61.901	58.069	61.468	451.102	100
D9	24	−2.175	61.541	61.127	54.130	58.414	432.450	100
D10	26	−2.175	56.781	60.352	56.430	60.910	441.877	100
D11	22	−2.175	57.180	58.296	53.916	62.808	448.528	100
D12	19	−2.100	56.584	56.610	56.277	59.812	433.202	100
D13	13	−0.100	54.532	64.596	63.273	56.566	427.938	99.8
D14	22	−2.175	56.463	65.170	56.274	59.191	436.517	100
D15	19	−2.175	56.597	63.438	58.574	61.687	449.512	100
D16	24	−2.175	55.875	62.664	56.338	63.585	456.360	100
D17	24	−2.175	61.231	61.017	53.595	60.530	442.449	100
D18	28	−2.075	60.937	59.563	56.312	58.646	433.475	100
D19	22	−2.175	61.236	58.527	58.138	59.967	440.776	100
D20	16	−2.175	61.106	62.811	54.460	62.464	454.119	100
D21	13	−2.175	60.648	61.435	57.030	59.409	438.931	100
D22	24	−2.175	60.518	60.656	54.852	61.906	449.370	100
D23	16	−2.075	61.017	58.235	57.567	59.156	435.955	100
D24	20	−2.175	60.523	57.771	59.979	61.272	447.428	100
D25	16	−2.175	60.922	61.801	57.210	58.288	433.899	100

Avg.	21.84	−1.991	59.929	61.182	56.835	59.983	441.060	>99.9
Stand. dev.	6.61	0.570	2.400	2.374	2.394	1.959	8.901	0.1

TABLE 4
SCENARIO ANALYSIS 3—SUSTAINABILITY

No.	CT	FTE_0	FTE_1	FTE_2	FTE_3	FTE_4	VEQ	COV
S1	20	−2.175	59.440	60.212	54.168	62.111	448.645	100
S2	20	−2.175	59.414	60.244	54.156	62.121	448.693	100
S3	24	−2.175	59.447	60.244	53.485	60.505	440.076	100
S4	41	−2.175	59.286	59.938	53.036	59.995	436.806	100

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TRANSLATED VERSION: SPANISH

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSION TRADUCIDA: ESPAÑOL

A continuación se muestra una traducción aproximada de las ideas presentadas anteriormente. Esto se hizo para dar una comprensión general de las ideas presentadas en el documento. Por favor, disculpe cualquier error gramatical y no responsabilite a los autores originales de estos errores.

INTRODUCCIÓN

El enfoque y el estudio de caso propuesto en este documento están motivados por un productor alemán de accesorios sanitarios que fue adquirido por una empresa de capital privado. El antiguo fabricante, negociado como una acción conjunta, se caracterizó por la expansión en curso y, por lo tanto, se desarrolló a un líder mundial en el segmento de mercado. Después de 10 años, y a pesar de que la compañía seguía creciendo, los propietarios decidieron venderlo a un inversor institucional. El nuevo propietario comenzó a coordinar todo el negocio mediante el nombramiento de un holding que reclamó salidas masivas anuales de efectivo de la cadena de suministro relacionada (SC). Esto dio lugar a actividades de reestructuración, incluida la necesidad de reducir los costes y el personal. Una disminución resultante de las ventas y los beneficios comenzó a poner en riesgo la permanencia de la empresa. Las razones de los problemas de negocios eran obvias. El inversor consideró la adquisición como una inversión financiera pura centrándose únicamente en el rendimiento esperado. En este caso, se nos hizo caso de las estructuras de red eficientes existentes, incluidas las ubicaciones, las capacidades y las relaciones con los interlocutores comerciales, así como las operaciones de la cadena de suministro, ya que en este caso se pudo observar un desacoplamiento contraproducente de las decisiones.

Un modelo cuantitativo adecuado para resolver el problema antes mencionado debe cumplir los siguientes requisitos: En primer lugar, debe ser aplicable a las estructuras de la cadena de suministro intraodi parte (Morash y Clinton 1998; 2011; también conocido como SC, Longinidis y Georgiadis 2011 de toda la empresa, con decisiones centralizadas que son controladas por un inversionista institucional después de la adquisición de la compañía. Debido a la contratación plurianual del inversor, deben tenerse en cuenta tanto los ajustes a largo plazo del diseño de la cadena de suministro como los cambios resultantes en las operaciones de la cadena de suministro. Por lo tanto, debe preferirse el modelado de tiempo discreto (Van Roy y Erlenkotter 1982). Dado que la prevención de la insolvencia durante el compromiso requiere una compensación de liquidez en cada período, el modelado debe combinar la planificación de la cadena de suministro y la planificación financiera (Shapiro 2004) teniendo en cuenta las series de flujo de efectivo y los instrumentos de financiación. En particular, un enfoque de flujo a capital (FTE) es aplicable en nuestro caso, ya que mide el efectivo disponible para ser pagado al inversionista después de satisfacer las necesidades de reinversión (Damodaran 2012). Como es relevante para los importes efectivamente devueltos, el enfoque de capital subyacente se centra exclusivamente en los flujos de efectivo después de pagos efectivos de impuestos.

El artículo se estructura de la siguiente manera: la Sección 2 ofrece una revisión bibliográfica de otras contribuciones relevantes que revelan que el modelo de optimización presentado ofrece un enfoque conceptual para resolver el problema mencionado y amplía la investigación existente en el campo tratado. La formulación matemática basada en perfiles de capacidad alternativamente seleccionables se presenta en la Sección 3. Una variante de modelo utilizando niveles de capacidad se representa en la sección 4. El caso práctico de la citada empresa sanitaria se presenta en Sects. 5 y 6. Para discutir las consecuencias de las

fluctuaciones en la demanda, las incertidumbres en la determinación de las tasas de descuento y la consideración de los requisitos de sostenibilidad, utilizamos un análisis de escenarios en la Sección 7.

CONCLUSIÓN

El caso de estudio antes mencionado es un representante de un fenómeno económico creciente. En caso de que surja un problema de solvencia, que puede ser causado por fallas en la gestión o por la situación económica general, a menudo los inversores institucionales (por ejemplo, las sociedades de capital privado) se apoderan de empresas bien establecidas durante un período limitado de tiempo. De ello, los accionistas conectan las expectativas de rentabilidad, que tienen que ser satisfechas por los pagos regulares tomados de los beneficios. A pesar de que hay ejemplos en los que las empresas existentes se cerraron después de la adquisición, la continuación de las operaciones de la cadena de suministro debe ser un objetivo principal de acuerdo con las solicitudes políticas y sociales, ya que garantiza los rendimientos continuos.

Para alcanzar el objetivo antes mencionado, en este documento se propone un modelo no lineal de flujo de efectivo descedido para la coordinación de los pagos anuales a un inversor durante su compromiso con la planificación de SC (es decir, liquidaciones y aperturas de ubicación, ajustes de capacidad, selección de mercados de ventas y proveedores, operaciones de SC) y planificación financiera. El enfoque de dos fases también considera las operaciones que serían posibles mediante el uso de la estructura de red que resulta al final de la contratación del inversor. Nuestro objetivo (maximización del valor actual del capital) también cubre el valor residual de la perpetuidad esperada de los pagos. A diferencia de los enfoques basados en datos que se pueden encontrar en la literatura en este campo, modelamos las relaciones relevantes entre las decisiones anuales mediante un sistema de restricciones interdependientes. En particular, estas decisiones comprenden transacciones en el mercado de capitales que están influenciadas de manera realista por el límite global de deuda de la empresa y la deuda total actual dentro de los períodos de tiempo de la contratación. Debido a las situaciones cambiantes del mercado, se tienen en cuenta los tipos de interés dependientes de la duración teniendo en cuenta los períodos de tiempo específicos que las transacciones comienzan y finalizan. Se capturan las compensaciones resultantes entre el volumen de financiación, los pagos de intereses y el escudo fiscal.

Se hace obvio que el problema descrito anteriormente es difícil debido a su complejidad. Sin embargo, nuestros cálculos utilizando software y hardware de alto rendimiento revelaron que el uso de perfiles de capacidad (que representan secuencias factibles o incluso deseables de niveles de capacidad, y son alternativamente seleccionables por los administradores de red) conduce al hecho de que el caso de estudio de la empresa sanitaria alemana podría resolverse para una optimización en cuestión de segundos. Lo mismo se aplica a todas las instancias de prueba en nuestro análisis de escenarios, que se llevó a cabo para capturar las fluctuaciones de la demanda, las incertidumbres en la determinación de los tipos de descuento, así como la consideración de los requisitos de sostenibilidad. Mediante la implementación de una de nuestras soluciones antes mencionadas, se puede suponer que los problemas de negocio de la empresa asumida por el inversor institucional podrían haber sido evitados o al menos mitigados.

La investigación adicional puede abordar los siguientes aspectos: En la medida en que sea posible una estimación fiable, las tasas de crecimiento de la empresa después del compromiso del inversor se pueden tener en cuenta al tiempo que se maximiza el valor actual del capital dentro del enfoque FTE. Con respecto al acceso limitado a los fondos, se pueden añadir formas alternativas de financiación. Para la captura de cuestiones internacionales de planificación de la red, pueden incluirse los efectos de los diferentes tipos de cambio y derechos de aduana. Las consideraciones sobre el modelado también pueden centrarse en la subjetividad de la valoración, es decir, el campo de decisión individual y los objetivos del inversor. Por último, se puede implementar la coordinación de las decisiones anuales resultantes de nuestro modelo propuesto con planificación continua de tiempo a corto plazo en las ubicaciones.

TRANSLATED VERSION: FRENCH

Below is a rough translation of the insights presented above. This was done to give a general understanding of the ideas presented in the paper. Please excuse any grammatical mistakes and do not hold the original authors responsible for these mistakes.

VERSION TRADUITE: FRANÇAIS

Voici une traduction approximative des idées présentées ci-dessus. Cela a été fait pour donner une compréhension générale des idées présentées dans le document. Veuillez excuser toutes les erreurs grammaticales et ne pas tenir les auteurs originaux responsables de ces erreurs.

INTRODUCTION

L'approche et l'étude de cas proposées dans ce document sont motivées par un producteur allemand d'accessoires sanitaires qui a été acquis par une société de capital-investissement. L'ancien fabricant, négocié en actions par actions, a été caractérisé par une expansion continue et s'est ainsi développé pour se développer à un leader mondial dans le segment de marché. Après 10 ans, et même si l'entreprise était encore en croissance, les propriétaires ont décidé de la vendre à un investisseur institutionnel. Le nouveau propriétaire a commencé à coordonner l'ensemble de l'entreprise en nommant une société de portefeuille qui a réclamé des sorties de trésorerie annuelles massives de la chaîne d'approvisionnement connexe (SC). Cela a conduit à des activités de restructuration, y compris la nécessité de réduire les coûts et le personnel. Une baisse des ventes et des bénéfices qui en a résulté a commencé à risquer la poursuite de l'existence de l'entreprise. Les raisons des problèmes d'affaires étaient évidentes. L'investisseur considérait l'acquisition comme un investissement financier pur axé uniquement sur le rendement attendu. Les structures réseau efficaces existantes, y compris les emplacements, les capacités et les relations avec les partenaires commerciaux, ainsi que les opérations de la chaîne d'approvisionnement, ont été ignorées, car un découplage contreproductif des décisions a pu être observé dans ce cas.

Un modèle quantitatif approprié pour résoudre le problème susmentionné doit répondre aux exigences suivantes : premièrement, il doit s'appliquer aux structures intra-organisationnelles de la chaîne d'approvisionnement (Morash et Clinton, 1998; Flynn et coll. 2011; également appelé SC, Longinidis et Georgiadis 2011 à l'échelle de l'entreprise) avec des décisions centralisées qui sont contrôlées par un investisseur institutionnel après la reprise de l'entreprise. En raison de l'engagement pluriannuel de l'investisseur, il faut tenir compte des ajustements à long terme de la conception de la chaîne d'approvisionnement et des changements qui en résultent dans les opérations de la chaîne d'approvisionnement. Par conséquent, la modélisation discrète du temps (Van Roy et Erlenkotter, 1982) devrait être préférée. Comme la prévention de l'insolvabilité au cours de l'engagement exige une compensation des liquidités à chaque période, la modélisation doit combiner planification de la chaîne d'approvisionnement et planification financière (Shapiro 2004) en tenant compte des séries de flux de trésorerie et des instruments de financement. En particulier, une approche flux-capitaux propres (ETP) s'applique dans notre cas, car elle mesure les liquidités disponibles à payer à l'investisseur après avoir rencontré les besoins de réinvestissement (Damodaran 2012). En ce qui concerne les montants effectivement retournés, l'approche des capitaux propres sous-jacents se concentre exclusivement sur les flux de trésorerie après paiements d'impôts efficaces.

L'article est structuré comme suit : la section 2 donne un examen de la littérature d'autres contributions pertinentes révélant que le modèle d'optimisation présenté offre une approche conceptuelle pour résoudre le problème mentionné et étend la recherche existante dans le domaine traité. La formulation mathématique basée sur des profils de capacité sélectionnables alternativement est présentée dans la secte 3. Une variante modèle utilisant les niveaux de capacité est représentée dans la secte 4. L'étude de cas de la société sanitaire susmentionnée est présentée dans Sects. 5 et 6. Pour discuter des conséquences des fluctuations de la

demande, des incertitudes dans la détermination des taux d'actualisation et de l'examen des exigences en matière de durabilité, nous utilisons une analyse de scénario dans l'article 7.

CONCLUSION

L'étude de cas susmentionnée est représentative d'un phénomène économique croissant. Dans le cas où un problème de solvabilité survient, qui peut être causé soit par des défaillances de la direction, soit par la situation économique générale, alors souvent des investisseurs institutionnels (p. Ex., des sociétés de capital-investissement) prennent le contrôle d'entreprises bien établies pour une période limitée. Par conséquent, les actionnaires relient les attentes de rendement, qui doivent être satisfaites par des paiements réguliers prélevés sur les bénéfices. Même s'il existe des exemples où les entreprises existantes ont été fermées après la reprise, la poursuite des opérations de la chaîne d'approvisionnement devrait être un objectif principal, conformément aux demandes politiques et sociales, car elle garantit des rendements continus.

Pour atteindre l'objectif susmentionné, un modèle de flux de trésorerie actualisé s'il n'y a pas de flux de capitaux propres pour la coordination des paiements annuels à un investisseur au cours de son engagement auprès de SC planning (c.-à-d. Liquidations et ouvertures de localisation, ajustements de capacité, choix du marché de vente et des fournisseurs, opérations sc) et planification financière est proposé dans le présent document. L'approche en deux phases tient compte en outre des opérations qui seraient possibles en utilisant la structure du réseau résultant à la fin de l'engagement de l'investisseur. Notre objectif (maximisation de la valeur actuelle des capitaux propres) couvre également la valeur résiduelle de la perpétuité prévue des paiements. Contrairement aux approches axées sur les données que l'on retrouve dans la littérature dans ce domaine, nous modélisons les relations pertinentes entre les décisions annuelles par un système de contraintes interdépendantes. En particulier, ces décisions comprennent des transactions sur le marché des capitaux qui sont influencées de façon réaliste par la limite globale de la dette de la société et la dette totale actuelle dans les périodes de l'engagement. En raison de l'évolution de la situation du marché, les taux d'intérêt dépendant de la durée en tenant compte des périodes spécifiques pendant lesquelles les transactions commencent et se terminent sont pris en considération. Les compromis qui en résultent entre le volume de financement, les paiements d'intérêts et le bouclier fiscal sont saisis.

Il devient évident que le problème décrit ci-dessus est difficile en raison de sa complexité. Cependant, nos calculs utilisant des logiciels et du matériel haute performance ont révélé que l'utilisation de profils de capacité (qui représentent des séquences réalisables, voire souhaitables, des niveaux de capacité, et sont alternativement sélectionnables par les gestionnaires de réseau) conduit au fait que l'étude de cas de la société sanitaire allemande pourrait être résolue à l'optimalité en quelques secondes. Il en va de même pour tous les cas d'essai de notre analyse de scénario, qui a été effectuée pour tenir compte des fluctuations de la demande, des incertitudes dans la détermination des taux d'actualisation ainsi que de l'examen des exigences en matière de durabilité. En mettant en œuvre l'une de nos solutions susmentionnées, on peut présé dire que les problèmes commerciaux de l'entreprise reprise par l'investisseur institutionnel auraient pu être évités ou du moins atténués.

D'autres recherches peuvent aborder les aspects suivants : Dans la mesure du possible, les taux de croissance de l'entreprise après l'engagement de l'investisseur peuvent être pris en compte tout en maximisant la valeur actuelle des capitaux propres dans le cadre de l'approche ETP. En ce qui concerne l'accès limité aux fonds, d'autres formes de financement peuvent être ajoutées. Pour saisir les questions internationales de planification des réseaux, les effets des différents taux de change et droits de douane peuvent être inclus. Les considérations relatives à la modélisation peuvent également se concentrer sur la subjectivité de l'évaluation, c'est-à-dire sur le champ de décision individuel et les cibles de l'investisseur. Enfin, la coordination des décisions annuelles découlant de notre modèle proposé avec une planification à court terme à temps continu aux emplacements peut être mise en œuvre.

TRANSLATED VERSION: GERMAN

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ÜBERSETZTE VERSION: DEUTSCH

Hier ist eine ungefähre Übersetzung der oben vorgestellten Ideen. Dies wurde getan, um ein allgemeines Verständnis der in dem Dokument vorgestellten Ideen zu vermitteln. Bitte entschuldigen Sie alle grammatikalischen Fehler und machen Sie die ursprünglichen Autoren nicht für diese Fehler verantwortlich.

EINLEITUNG

Der Ansatz und die in diesem Papier vorgeschlagene Fallstudie werden von einem deutschen Sanitärarmaturenhersteller motiviert, der von einer Private-Equity-Gesellschaft übernommen wurde. Der als Aktien gehandelte Traditionshersteller zeichnete sich durch eine kontinuierliche Expansion aus und entwickelte sich damit zu einem Weltmarktführer im Marktsegment. Nach 10 Jahren und obwohl das Unternehmen noch wuchs, beschlossen die Eigentümer, es an einen institutionellen Investor zu verkaufen. Der neue Eigentümer begann, das gesamte Geschäft zu koordinieren, indem er eine Holdinggesellschaft ernennt, die massive jährliche Mittelabflüsse aus der damit verbundenen Lieferkette (SC) beanspruchte. Dies führte zu Umstrukturierungsmaßnahmen, einschließlich der Notwendigkeit, Kosten und Personal zu senken. Ein daraus resultierender Rückgang von Umsatz und Gewinn gefährdete den Fortbestand des Unternehmens. Die Gründe für die geschäftlichen Probleme lagen auf der Hand. Der Investor betrachtete die Übernahme als reine Finanzinvestition, die sich nur auf die erwartete Rendite konzentrierte. Bestehende effiziente Netzwerkstrukturen einschließlich Standorte, Kapazitäten und Geschäftspartnerbeziehungen sowie die Supply-Chain-Operationen wurden nicht berücksichtigt, da in diesem Fall eine kontraproduktive Entkopplung von Entscheidungen zu beobachten war.

Ein quantitatives Modell, das zur Lösung des oben genannten Problems geeignet ist, muss die folgenden Anforderungen erfüllen: Erstens muss es auf unternehmensinterne Lieferkettenstrukturen anwendbar sein (Morash und Clinton 1998; Flynn et al. 2011; auch als unternehmensweit SC, Longinidis und Georgiadis 2011 bezeichnet) mit zentralisierten Entscheidungen, die nach der Unternehmensübernahme von einem institutionellen Investor kontrolliert werden. Aufgrund des mehrjährigen Engagements des Investors müssen sowohl langfristige Anpassungen des Supply Chain Designs als auch daraus resultierende Veränderungen der Supply Chain-Operationen berücksichtigt werden. Daher sollte die diskrete Zeitmodellierung (Van Roy und Erlenkotter 1982) bevorzugt werden. Da die Verhinderung einer Insolvenz während des Engagements in jedem Zeitraum liquiditätsausgleichen erfordert, muss die Modellierung Die Lieferkettenplanung und Finanzplanung (Shapiro 2004) unter Berücksichtigung von Cashflow-Serien und Finanzierungsinstrumenten kombinieren. Insbesondere ist in unserem Fall ein Flow-to-Equity-Ansatz (FTE) anwendbar, da er das verfügbare Geld misst, das dem Investor nach Behebedeckungsbedarf ausgezahlt werden soll (Damodaran 2012). Da die tatsächlich zurückgezahlten Beträge relevant sind, konzentriert sich der zugrunde liegende Eigenkapitalansatz ausschließlich auf Cashflows nach effektiven Steuerzahlungen.

Der Artikel ist wie folgt aufgebaut: Abschnitt 2 gibt einen Literaturüberblick über andere relevante Beiträge, die zeigen, dass das vorgestellte Optimierungsmodell einen konzeptionellen Ansatz zur Lösung des genannten Problems bietet und die bestehende Forschung im behandelten Bereich erweitert. Die mathematische Formulierung auf Basis alternativ wählbarer Kapazitätsprofile wird in Abschnitt 3 dargestellt. Eine Modellvariante mit Kapazitätsstufen ist in Abschnitt 4 dargestellt. Die Fallstudie des vorgenannten Sanitärunternehmens wird in Sects vorgestellt. 5 und 6. Um die Folgen von Nachfrageschwankungen, Unsicherheiten bei der Festlegung von Diskontierungssätzen und die Berücksichtigung von Nachhaltigkeitsanforderungen zu diskutieren, verwenden wir eine Szenarioanalyse in Abschnitt 7.

SCHLUSSFOLGERUNG

Die vorgenannte Fallstudie ist ein Vertreter eines zunehmenden wirtschaftlichen Phänomens. Tritt ein Solvabilitätsproblem auf, das entweder durch Managementfehler oder die allgemeine wirtschaftliche Situation verursacht werden kann, übernehmen oft institutionelle Investoren (z. B. Private-Equity-Gesellschaften) für einen begrenzten Zeitraum etablierte Unternehmen. Damit verbinden die Aktionäre Renditeerwartungen, die durch regelmäßige Gewinnausschüttungen befriedigt werden müssen. Auch wenn es Beispiele dafür gibt, dass bestehende Unternehmen nach der Übernahme geschlossen wurden, sollte die Fortführung des Lieferkettengeschäfts ein vorrangiges Ziel im Einklang mit politischen und sozialen Forderungen sein, da sie laufende Renditen garantiert.

Um das oben genannte Ziel zu erreichen, wird in diesem Papier ein nichtlineares Flow-to-Equity-Discounted-Cashflow-Modell für die Koordination der jährlichen Auszahlungen an einen Investor während seines Engagements bei der SC-Planung (z. B. Standortliquidationen und -eröffnungen, Kapazitätsanpassungen, Verkaufsmarkt- und Lieferantenauswahl, SC-Operationen) und Finanzplanung vorgeschlagen. Der zweiphasige Ansatz berücksichtigt zusätzlich Operationen, die durch die Nutzung der Netzwerkstruktur, die sich am Ende des Engagements des Investors ergibt, möglich wären. Unser Ziel (Maximierung des Barwerts des Eigenkapitals) umfasst auch den Restwert der erwarteten Dauerhaftigkeit der Auszahlungen. Im Gegensatz zu datengesteuerten Ansätzen, die in der Literatur in diesem Bereich zu finden sind, modellieren wir relevante Zusammenhänge zwischen jährlichen Entscheidungen durch ein System voneinander abhängiger Zwänge. Diese Entscheidungen umfassen insbesondere Transaktionen am Kapitalmarkt, die realistischdurch durch die Gesamtschuldengrenze des Unternehmens und die aktuelle Gesamtverschuldung innerhalb der Zeiträume des Engagements beeinflusst werden. Aufgrund sich verändernder Marktsituationen werden zeitabhängige Zinssätze unter Berücksichtigung der spezifischen Zeiträume, in denen die Transaktionen beginnen und enden, berücksichtigt. Daraus ergeben sich Kompromisse zwischen Finanzierungsvolumen, Zinszahlungen und Steuerabschirmung.

Es wird offensichtlich, dass das oben beschriebene Problem aufgrund seiner Komplexität eine Herausforderung darstellt. Unsere Berechnungen mit hochleistungsfähiger Software und Hardware haben jedoch ergeben, dass die Verwendung von Kapazitätsprofilen (die machbare oder sogar wünschenswerte Kapazitätsabläufe darstellen und von den Netzwerkmanagern alternativ wählbar sind) dazu führt, dass die Fallstudie des deutschen Sanitärunternehmens innerhalb von Sekunden optimal gelöst werden konnte. Dasselbe gilt für alle Testinstanzen in unserer Szenarioanalyse, die durchgeführt wurde, um Nachfrageschwankungen, Unsicherheiten bei der Festlegung von Diskontierungssätzen sowie die Berücksichtigung von Nachhaltigkeitsanforderungen zu erfassen. Durch die Umsetzung einer unserer vorgenannten Lösungen kann davon ausgenommen werden, dass die Geschäftsprobleme des vom institutionellen Investor übernommenen Unternehmens hätten verhindert oder zumindest gemildert werden können.

Weitere Forschungen können folgende Aspekte berücksichtigen: Soweit eine verlässliche Schätzung möglich ist, können Wachstumsraten des Unternehmens nach dem Engagement des Investors berücksichtigt und gleichzeitig der Barwert des Eigenkapitals im Rahmen des FTE-Ansatzes maximiert werden. Im Hinblick auf den begrenzten Zugang zu Mitteln können alternative Finanzierungsformen hinzugefügt werden. Für die Erfassung internationaler Fragen der Netzplanung können die Auswirkungen unterschiedlicher Wechselkurse und Zölle einbezogen werden. Überlegungen zur Modellierung können sich auch auf die Subjektivität der Bewertung konzentrieren, d. H. Auf das individuelle Entscheidungsfeld und die Ziele des Anlegers. Schließlich kann die Koordination der jährlichen Entscheidungen, die sich aus unserem vorgeschlagenen Modell ergeben, mit einer kontinuierlichen kurzfristigen Planung an den Standorten umgesetzt werden.

TRANSLATED VERSION: PORTUGUESE

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VERSÃO TRADUZIDA: PORTUGUÊS

Aqui está uma tradução aproximada das ideias acima apresentadas. Isto foi feito para dar uma compreensão geral das ideias apresentadas no documento. Por favor, desculpe todos os erros gramaticais e não responsacule os autores originais responsáveis por estes erros.

INTRODUÇÃO

A abordagem e o estudo de caso proposto neste artigo são motivados por um produtor alemão de acessórios sanitários que foi adquirido por uma empresa de private equity. O antigo fabricante, negociado como um estoque conjunto, foi caracterizado pela expansão contínua e, assim, desenvolvido para um líder global no segmento de mercado. Após 10 anos, e mesmo que a empresa ainda estivesse crescendo, os proprietários decidiram vendê-la a um investidor institucional. O novo proprietário começou a coordenar todo o negócio, nomeando uma holding que reivindicava enormes saídas anuais de caixa da cadeia de suprimentos relacionada (SC). Isso levou a atividades de reestruturação, incluindo a necessidade de reduzir custos e pessoal. Uma queda resultante nas vendas e nos lucros começou a arriscar a existência contínua da empresa. As razões para os problemas de negócios eram óbvias. O investidor considerou a aquisição como puro investimento financeiro com foco apenas no retorno esperado. As estruturas de rede eficientes existentes, incluindo localizações, capacidades e relações de parceiros de negócios, bem como as operações da cadeia de suprimentos foram desconsideradas, uma vez que um desacoplamento contraproducente de decisões poderia ser observado neste caso.

Um modelo quantitativo adequado para a resolução do problema acima mencionado deve atender aos seguintes requisitos: Primeiro, deve ser aplicável às estruturas da cadeia de suprimentos intra-organizacional (Morash e Clinton 1998; Flynn et al. 2011; também referido como SC, Longinidis e Georgiadis 2011) com decisões centralizadas que são controladas por um investidor institucional após a aquisição da empresa. Devido ao engajamento multianual do investidor, tanto os ajustes de longo prazo do projeto da cadeia de suprimentos quanto as consequentes mudanças nas operações da cadeia de suprimentos devem ser levados em conta. Portanto, a modelagem de tempo discreta (Van Roy e Erlenkotter 1982) deve ser preferida. Como a prevenção da insolvência durante o engajamento requer compensação de liquidez em cada período, a modelagem deve combinar o planejamento da cadeia de suprimentos e o planejamento financeiro (Shapiro 2004) levando em conta séries de fluxo de caixa e instrumentos de financiamento. Em particular, uma abordagem flow-to-equity (FTE) é aplicável em nosso caso, pois mede o dinheiro disponível para ser pago ao investidor após atender às necessidades de reinvestimento (Damodaran 2012). Como relevante para os valores efetivamente devolvidos, a abordagem patrimonial subjacente foca exclusivamente nos fluxos de caixa após pagamentos efetivos de impostos.

O artigo está estruturado da seguinte forma: a Seção 2 faz uma revisão biblio literatura de outras contribuições relevantes revelando que o modelo de otimização apresentado oferece uma abordagem conceitual para resolver o problema mencionado e amplia a pesquisa existente no campo tratado. A formulação matemática baseada em perfis de capacidade selecionáveis alternativamente selecionáveis é apresentada na Seita 3. Uma variante de modelo usando níveis de capacidade é retratada em Sect. 4. O estudo de caso da referida empresa sanitária é apresentado em Seitas. 5 e 6. Para discutir as consequências das flutuações na demanda, as incertezas na determinação das taxas de desconto e a consideração dos requisitos de sustentabilidade, utilizamos uma análise de cenário na Seita 7.

CONCLUSÃO

O referido estudo de caso é um representante de um fenômeno econômico crescente. No caso de surgir um problema de solvência, que pode ser causado por falhas de gestão ou pela situação econômica geral, então, muitas vezes, investidores institucionais (por exemplo, empresas de private equity) assumem negócios bem estabelecidos por um período limitado de tempo. Com isso, os acionistas conectam as expectativas de retorno, que devem ser satisfeitas com pagamentos regulares obtidos com os lucros. Embora existam exemplos em que as empresas existentes foram fechadas após a aquisição, a continuação das operações da cadeia de suprimentos deve ser um objetivo principal de acordo com as solicitações políticas e sociais, pois garante retornos contínuos.

Para alcançar a meta acima mencionada, é proposto neste artigo um modelo de fluxo de caixa descontado de fluxo de capital não linear para a coordenação dos pagamentos anuais a um investidor durante seu compromisso com o planejamento de SC (ou seja, liquidações e aberturas de localização, ajustes de capacidade, mercado de vendas e seleção de fornecedores, operações de SC) e planejamento financeiro. A abordagem em duas fases também considera operações que seriam possíveis usando a estrutura de rede resultante no final do engajamento do investidor. Nosso objetivo (maximização do valor presente do patrimônio líquido) também abrange o valor residual da perpetuidade esperada dos pagamentos. Em contraste com abordagens baseadas em dados que podem ser encontradas na literatura neste campo, modelamos relações relevantes entre decisões anuais por um sistema de restrições interdependentes. Em particular, essas decisões compreendem transações no mercado de capitais que são influenciadas de forma realista pelo limite geral da dívida da empresa e pela dívida total atual dentro dos períodos de tempo do contrato. Devido às mudanças nas situações do mercado, as taxas de juros dependentes de duração levando em conta os períodos específicos de início e fim das transações são consideradas. São captadas compensações resultantes entre volume de financiamento, pagamentos de juros e escudo fiscal.

Torna-se óbvio que o problema descrito acima é desafiador devido à sua complexidade. No entanto, nossos cálculos usando software e hardware de alto desempenho revelaram que o uso de perfis de capacidade (que representam sequências viáveis ou até desejáveis de níveis de capacidade, e são alternativamente selecionáveis pelos gerentes de rede) leva ao fato de que o estudo de caso da empresa sanitária alemã poderia ser resolvido com a idealidade em segundos. O mesmo se aplica a todas as instâncias de teste em nossa análise de cenário, que foi realizada para captar flutuações na demanda, incertezas na determinação de taxas de desconto, bem como a consideração dos requisitos de sustentabilidade. Ao implementar uma de nossas soluções acima mencionadas, pode-se supõe-se que os problemas de negócios da empresa assumidos pelo investidor institucional poderiam ter sido evitados ou pelo menos mitigados.

Outras pesquisas podem abordar os seguintes aspectos: Na medida em que uma estimativa confiável é possível, as taxas de crescimento da empresa após o engajamento do investidor podem ser levadas em conta, maximizando o valor atual do patrimônio líquido dentro da abordagem FTE. Com relação ao acesso limitado aos fundos, podem ser adicionadas formas alternativas de financiamento. Para a captura de questões internacionais de planejamento de rede, podem ser incluídos efeitos de diferentes taxas de câmbio e direitos aduaneiros. Considerações sobre modelagem também podem focar na subjetividade da avaliação, ou seja, no campo de decisão individual e metas do investidor. Finalmente, a coordenação das decisões anuais resultantes do nosso modelo proposto com planejamento contínuo de curto prazo nos locais pode ser implementada.